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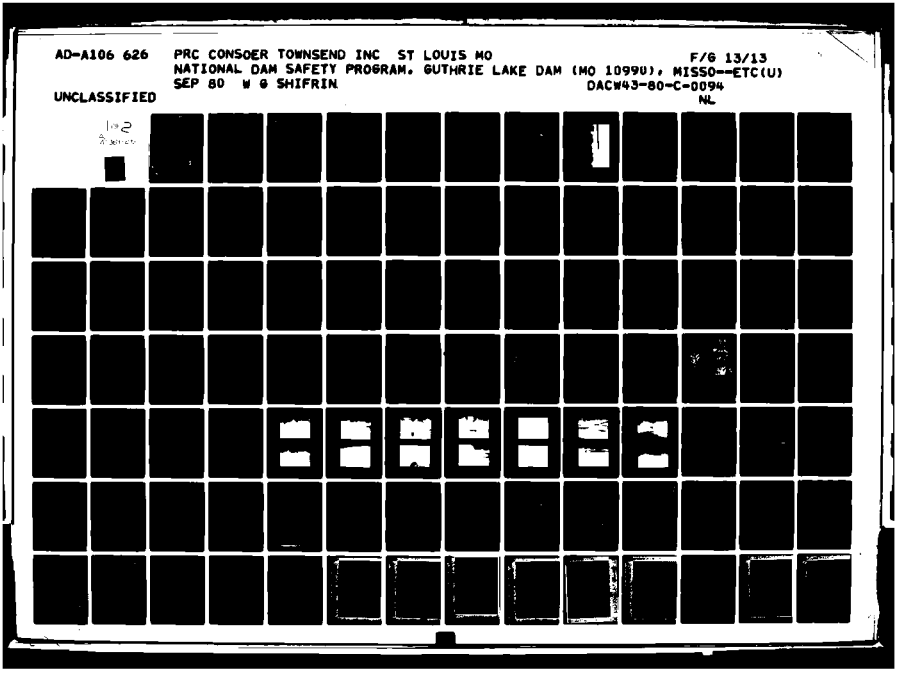

MISSOURI - KANSAS CITY RIVER BASIN

GUTHRIE LAKE DAM
CALLAWAY COUNTY, MISSOURI
MO. 10990

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

SEPTEMBER, 1980

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF

Cont'd

SUBJECT: Guthrie Lake Dam (Mo. 10990) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Guthrie Lake Dam (Mo. 10990).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood;
2) Overtopping could result in dam failure; and
3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED
Chief, Engineering Division — 03 OCT 1980 — Date

APPROVED BY: SIGNED
Colonel, CE, District Engineer — 07 Oct 1980 — Date

1

GUTHRIE LAKE DAM

CALLAWAY COUNTY, MISSOURI

MISSOURI INVENTORY NO. 10990

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY

CONSOER, TOWNSEND AND ASSOCIATES, LTD.

ST. LOUIS, MISSOURI

AND

PRC ENGINEERING CONSULTANTS, INC.

ENGLEWOOD, COLORADO

A JOINT VENTURE

UNDER DIRECTION OF

ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

SEPTEMBER 1980

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Guthrie Lake Dam, Missouri Inv. No. 10990
State Located: Missouri
County Located: Callaway
Stream: McKinney Creek
Date of Inspection: June 4, 1980

Assessment of General Condition

Guthrie Lake Dam was inspected by the engineering firms of Consoer, Townsend and Associates, Ltd. and PRC Engineering Consultants, Inc. (A Joint Venture) of St. Louis, Missouri according to the U. S. Army Corps of Engineers "Engineer Regulation No. 1110-2-106" and additional guidelines furnished by the St. Louis District of the Corps of Engineers. Based upon the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Within the estimated damage zone of three miles downstream of the dam are twelve dwellings, a commercial building, a bank, a Post Office, a U.S. Highway (U.S. 54), and an Interstate Highway (I-70), all of which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. Guthrie Lake Dam is in the small size classification since it is less than 40 feet in height and impounds less than 1000 acre-feet of water.

Our inspection and evaluation indicates that the reservoir/spillway system of Guthrie Lake Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Guthrie Lake Dam being a small size dam with a high hazard potential is required by the guidelines to be able to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood (PMF) without overtopping of the dam. Considering, however, the number of inhabited dwellings, commercial buildings, and highway crossings located downstream of the dam, the PMF is considered the appropriate spillway design flood for Guthrie Lake Dam. It was determined that the reservoir/spillway system can accommodate approximately 30 percent of the Probable Maximum Flood before overtopping of the dam occurs. Our evaluation also indicates that the reservoir/spillway system will accommodate the one-percent chance flood (100-year flood) without overtopping the dam.

The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region.

Guthrie Lake Dam and its appurtenant structures are in fair condition. Some deficiencies were noted by the inspection team, which could affect the safety of the dam and its appurtenant structures. These items are as follows: considerable damage to the downstream slope due to inadequate protection of the slope, cracks on the embankment, inadequate protection of the upstream slope both above and below the normal water surface, one small tree on the downstream slope, unmaintained vegetative cover on most of the embankment, the missing metal hood for the inlet of the principal spillway, the object lodged in the principal spillway pipe, the surface rusting of the principal spillway pipe, the tall grass and erosion in the emergency spillway channel and discharge channel, a need for periodic inspection by a qualified engineer and a lack of a maintenance schedule. The lack of seepage and stability analyses on record is also a deficiency that should be corrected.

The owner of the dam, Mr. Guthrie, voiced a concern about some of the deficiencies and stated that remedial measures have been taken to control the problems. Nevertheless, it is recommended that action be taken to correct or control the other deficiencies described above.

Walter G. Shifrin, P.E.

Overview of Guthrie Lake Dam

NATIONAL DAM SAFETY PROGRAM

GUTHRIE LAKE DAM, I.D. No. 10990

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

GUTHRIE LAKE DAM, Missouri Inv. No. 10990

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for Guthrie Lake Dam was carried out under Contract DACW 43-80-C-0094 between the Department of the Army, St. Louis District, Corps of Engineers, and the engineering firms of Consoer, Townsend & Associates, Ltd., and PRC Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of Guthrie Lake Dam was made on June 4, 1980. The purpose of the inspection was to make a general assessment regarding the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project, provides a summary of visual observations made during the field inspection, gives an assessment of hydrologic and hydraulic conditions at the site, presents an evaluation of the structural adequacy of the various project features and appraises the general condition of the dam with respect to safety.

Subsurface investigations, laboratory testing and detailed analyses were not within the scope of this study. No warranty as to the absolute safety of the project features is implied by the conclusions presented in this report.

It should be noted in this report that reference to the left or right abutments is viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to the east abutment or side, and right abutment or right side to the north abutment or side.

d. Evaluation Criteria

The inspection and evaluation of the dam is performed in accordance with the U.S. Army Corps of Engineers "Engineer Regulation No. 1110-2-106" and additional guidelines furnished by the St. Louis District office of the Corps of Engineers for Phase 1 Dam Inspections.

1.2 Description of the Project

a. Description of Dam and Appurtenances

The following description is based upon observations and measurements made during the visual inspection and conversations with Mr. Robert Guthrie, the owner, and Mr. Nelson Wilson, the contractor, who constructed the dam. No design drawings were available for the preparation of this report.

The dam is a homogeneous, rolled, earthfill structure between earth abutments, consisting of two straight portions of embankment angled at approximately 70 degrees to each other. A plan and elevation of the dam is shown on Plate 2 and Photos 1 through 3 show views of the dam. The major portion of the embankment has a bearing of approximately N 70° W and a length of 570 feet between the emergency spillway and the point of intersection of the two axes. The other portion of the dam runs in the North-South direction and has a length of 200 feet between the point of intersection of the two axes and the right abutment. The top of dam has a total length of 770 feet between the emergency spillway and the right abutment, and a top thickness which varies from 12 to 16 feet. The top of dam was measured to be level with an assumed elevation of 865 feet above mean sea level (M.S.L.). The maximum structural height of the dam was measured as 26 feet. The upstream slope was measured to be 1 vertical to 4 horizontal (1V to 4H), above the water surface. The downstream slope varies between 1V to 2H and 1V to 1.75H. According to Mr. Guthrie and Mr. Wilson, a 6-foot wide by 6-foot deep core trench was constructed paralle` to the dam axis but not into bedrock.

The dam was constructed with a double spillway scheme; the first is considered the principal spillway and operates as a closed conduit when full, and the second is considered the emergency spillway and operates as an open channel.

The principal spillway was constructed from welded steel pipe with a 3/16-inch wall thickness and a 10.5-inch inside diameter (see Photo 5). It was laid through the embankment 370 feet to the right of the emergency spillway on a grade of approximately 21 percent. The inlet end of the conduit is a direct entrance type of inlet and is cut at approximately 35 degrees with the top of the pipe protruding out over the bottom (see Photo 5). There is supposed to be a circular steel hood attached to the inlet end of the pipe as an anti-vortex device that also acts as sort of a trash rack; however, it has been broken off and now lies on the ground

nearby. The spillway crest elevation is at 860 feet above M.S.L. When the reservoir is high enough, water flows through the pipe to the outlet and directly into a discharge pool, falling vertically approximately a foot before entering the downstream channel (see Photo 6). According to Mr. Guthrie, there were two metal seepage collars installed on the pipe during construction.

The emergency spillway was constructed at the left abutment of the dam with a discharge channel that follows along the toe of the dam until it intersects with the downstream channel (see Photo 8). The spillway operates as a trapezoidal open channel with a top width of approximately 84 feet, a bottom width of 25 feet, and side slopes varying from about 1V in 10H to about 1V in 20H. The slope of the approach to the emergency spillway crest is about 8 percent, the crest itself is level for a distance of 25 feet and the slope of the discharge channel is about 4 percent. The elevation of the crest is about 862.8 feet above M.S.L.; this makes it about 2.8 feet above the principal spillway crest and about 2.2 feet below the top of dam.

No low-level outlets or outlet works were provided for this dam; however, a portable, diesel powered, centrifugal pump is used at the damsite (see Photo 11). The pump is used to pump water from the reservoir to a central pivot irrigation sprinkler system on the reservoir rim. According to Mr. Guthrie, the pump has a capacity of 1,100 gallons per minute (gpm). The pump was last used during the summer of 1979.

b. Location

Guthrie Lake Dam is located in Callaway County of the State of Missouri on McKinney Creek. The dam is located approximately 1.5 miles northwest of Kingdom City in the southwest corner of Section 5 of Range 9 West, Township 48 North as shown on the Kingdom City, Missouri Quadrangle (7.5 minute series) sheet.

c. Size Classification

Guthrie Lake Dam impounds less than 1,000 acre-feet but more than 50 acre-feet, which classifies it as a "small" size dam. However, the maximum structural height is less than 40 feet and greater than 25 feet and this also classifies it as a "small" size dam. The size classification is determined by either the storage or the height, whichever gives the larger size category. Therefore, the size classification is determined to fall within the "small" category, according to the "Engineer Regulation No. 1110-2-106, Appendix D" by the U.S. Department of the Army, Office of the Chief Engineer.

d. Hazard Classification

The dam has been classified as having a "high" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. From a visual inspection of the downstream area, our findings concur with this classification. There are twelve dwellings, a commercial building, a bank, a Post Office, a U.S. highway (U.S. 54), and an Interstate highway (I-70) crossing within the estimated damage zone, which extends approximately three miles downstream of the dam (see Photos 13 and 14).

e. Ownership

Guthrie Lake Dam is owned privately by Mr. and Mrs. Robert B. Guthrie. The mailing address is as follows: Mr. and Mrs. Robert B. Guthrie, R.R. 1, Kingdom City, Missouri, 65262.

f. Purpose of Dam

The main purpose of the dam is to impound water to be used for irrigation.

g. Design and Construction History

Guthrie Lake Dam was designed by the Department of Agriculture, Soil Conservation Service, in the Fulton, Missouri, office in June of 1976. Mr. Leland Tippet was the soil conservationist for the project. The dam was built in 1976 by Mr. Nelson Wilson, a local contractor from Mexico, Missouri.

h. Normal Operational Procedures

The normal procedure is to pump water from the reservoir during the summer months and to allow the reservoir to refill from runoff during the remaining months of the year. The water level in the reservoir is controlled by rainfall, runoff, evaporation, the elevation of the principal spillway crest, and the operation of the pump. The reservoir is allowed to remain as full as possible when the irrigation pump is not in operation.

According to Mr. Guthrie, every year since the construction of the dam, the reservoir has been drawn down during the summer months and is completely full by the spring of the following year. However, in the summer of 1979, the reservoir was drawn down but the reservoir did not completely recharge from runoff. The water surface elevation on the day of the inspection was measured to be 7.5 feet below the principal spillway crest.

1.3 Pertinent Data

a. Drainage Area (square miles):. 0.48

b. Discharge at Damsite

Estimated experienced maximum flood (cfs): 2

Estimated ungated spillway capacity with reservoir at top of dam elevation (cfs): 411

c. Elevation (Feet above M.S.L.)

Top of dam:. . . . . 865.0 (Assumed)

Spillway crest:

Principal Spillway 860.0

Emergency Spillway 862.8

Normal Pool: 860.0

Maximum Experienced Pool:. . . . . 861.0 (Approximately)

Observed Pool: 852.5

d. Reservoir

Length of pool with water surface at top of dam elevation (feet):. 2400

e. Storage (Acre-Feet)

Top of dam:. 436

Spillway crest:

Principal Spillway 236

Emergency Spillway 336

Normal Pool: 236

Maximum Experienced Pool:. 268

Observed Pool: 90.5

f. Reservoir Surfaces (Acres)

Top of dam:. 50

Spillway crest:

Principal Spillway 30

Emergency Spillway	41.5
Normal Pool:	30
Maximum Experienced Pool:.	34
Observed Pool:	15.5

g. Dam

Type:.	Rolled, Earthfill
Length:.	770 feet
Structural Height:	26 feet
Hydraulic Height:.	26 feet
Top width:	Varies from 12 to 16 feet
Side slopes:	
Downstream	Varies, 1V to 2H to 1V to 1.75H
Upstream	1V to 4H
Zoning:.	Homogeneous
Impervious core:	NA
Cutoff:.	A core trench 6 feet wide and 6 feet deep (According to Mr. Guthrie)
Grout curtain:	None
Freeboard above normal reservoir level:	5 feet
Volume:.	24,960 cu.yds. (SCS estimate)

h. Diversion and Regulating Tunnel. . . . . .None

i. Spillway

Type:	
Principal Spillway	Pipe, uncontrolled
Emergency Spillway	Earthcut channel, uncontrolled
Length of crest:	
Principal Spillway	NA, 10.5-inch inside diameter pipe
Emergency Spillway	25 feet
Crest Elevation (feet above MSL):	
Principal Spillway	860.0
Emergency Spillway	862.8

j. Regulating Outlets. . .	None; however a pump is used at the dam site to supply water from the reservoir to a sprinkler system on the reservoir rim.
Type:	Diesel powered, centrifugal pump (portable)
Location:	On the left side of the reservoir. (on the day of the inspection)
Closure:	None
Maximum Capacity:	1,100 gpm. (According to Mr. Guthrie)

SECTION 2: ENGINEERING DATA

2.1 Design

Guthrie Lake Dam was designed by the Soil Conservation Service of Callaway County, Missouri. The only design information obtained from the Soil Conservation Service consists of a copy of the original surveying notes of the damsite and hydraulic calculations. The hydraulic calculations are presented in this report (see Plate 4) and are dated January 26, 1976.

2.2 Construction

The construction data obtained for this dam consisted mostly of surveying notes and cut-fill quantities. Other information on the construction of the dam was obtained during a telephone conversation with Mr. Nelson Wilson, the contractor for the project, and confirmed by Mr. Guthrie on the day of the inspection. Mr. Wilson stated that a core trench was excavated into solid clay parallel to the axis of the dam. The fill was placed according to Soil Conservation Service standards and specifications. The Soil Conservation Service periodically inspected the construction of the dam; however, no compaction tests were made on the fill while it was being placed. One self-propelled scraper and one pull scraper were used to construct and compact the dam embankment. The soil for the embankment is primarily clay which was taken from the reservoir area and higher areas above the lake. Silty material was used in some areas to cover the clay for seeding the slopes of the embankment.

2.3 Operation

No operation records are available for Guthrie Lake Dam. The only information on the operation of the dam and appurtenant structures was obtained from Mr. Guthrie and is described in Section 1.2h.

2.4 Evaluation

a. Availability

The availability of engineering data is somewhat lacking and consists only of surveying notes, hydraulic calculations, a general soils map of the State of Missouri published by the Soil Conservation Service, State Geological Maps, and U.S.G.S. quadrangle sheets. No documented information was available on the construction or operation of the dam.

b. Adequacy

The available engineering data did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation and construction data, but is based primarily on visual inspection, past performance, and present condition of the dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity

The only valid engineering data are the surveying notes and hydraulic calculations obtained from the Soil Conservation Service. The hydraulic calculations show that the dam and spillways were designed to pass at least the 50-year flood. From our calculations (see Section 5.1d), it was determined that the dam and spillway are capable of passing the one-percent chance flood (100-year flood) without overtopping the dam.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of the Guthrie Lake Dam was made on June 4, 1980. The following persons were present during the inspection:

Name	Affiliation	Disciplines
Mark Haynes, P.E.	PRC Engineering Consultants, Inc.	Project Engineer, Soils and Mechanical
Jerry Kenny	PRC Engineering Consultants, Inc.	Hydraulics and Hydrology
Robert McLaughlin, P.E.	PRC Engineering Consultants, Inc.	Civil
Razi Ouraishi, R.P.G.	PRC Engineering Consultants, Inc.	Geology
John Lauth, P.E.	Consoer, Townsend & Assoc., Ltd.	Civil and Structural
Robert Guthrie	Owner	

Specific observations are discussed below.

b. Dam

The overall condition of the dam appears to be fair. Some items of concern were observed and are described below.

The top of dam appears to be adequately protected against surface erosion by a tall, unmaintained grass cover (see Photo 2). The grass, according to Mr. Guthrie, is being allowed to go to seed so that it will spread into unprotected areas on the slopes. The top of dam is occasionally used as a farm access road and, consequently, tire tracks due to vehicular traffic were observed. No tire ruts or depressions, which are sometimes associated with vehicular traffic across earthen structures, were seen. Noncontinuous longitudinal and transverse cracks were seen on the main section of the embankment. The cracks measured up to 6 inches deep, 1/4 of a inch wide and several feet long. No depressions indicating a settlement of the embankment were observed. No significant deviation in the vertical or horizontal alignment was apparent. According to Mr. Guthrie, the dam has never been overtopped and no evidence indicating the contrary was observed.

The upstream slope has no riprap protection; however, only minor wave erosion to the slope at the normal water surface level was found (see Photo 1). The water surface on the day of the inspection was measured to be about 7.5 feet below the normal water surface level, which facilitated a comprehensive inspection of the entire slope. The slope above the normal water surface level was supporting a sparse cover of grass. The grass cover did not appear to be adequate protection against surface erosion and some minor surface erosion was observed. On the slope below the normal water surface level, a considerable amount of small erosion gullies were observed and the slope has no erosion protection. Noncontinuous longitudinal and transverse cracks were observed on the upper portion of the slope. The cracks measured up to 12 inches deep, 1/4 of an inch wide and a few feet long. No bulges or depressions indicative of an instability of the slope were observed. The effect

of drawing down the reservoir has had no apparent adverse effect on the stability of the embankment.

For the most part, the downstream slope supports an unmaintained grass cover. The slope, however, is not adequately protected against surface erosion. In one area, approximately 150-feet long, above the principal spillway outlet, the slope has very little grass cover (see Photo 4) and, consequently, considerable damage to the slope due to surface erosion has occurred in this area. Attempts are being made to correct the problems as described above. Erosion gullies were observed over most of the slope. The gullies were measured up to 2 to 2.5 feet wide and 12 to 15 inches deep. Some shallow surface scarps due to sloughing were observed. Noncontinuous longitudinal cracks measuring up to 12 inches deep and 1/2 of an inch wide were observed at the top of some of the scarps, which is indicative of potential sloughing in the future. Noncontinuous longitudinal and transverse cracks were also observed over most of the slope. These cracks were also measured up to 12 inches deep and 1/2 of an inch wide. One small tree was observed growing on the slope. Several large trees were observed near the toe. No bulges or depressions indicative of an instability of the slope were observed. No seepage was observed on the embankment or downstream of the toe. However, standing water was observed in the discharge pool at the outlet end of the principal spillway (see Photo 6). Due to the fact that the reservoir water surface was fairly low on the day of inspection and has been there for some time and that no flowing water was observed downstream of the pool, it is believed that the water in the discharge pool is not due to seepage but is attributed to recent rainstorms in the area.

Both abutments slope gently upward from the top of dam. No instabilities, seepage or erosion were observed on either abutment.

No evidence of burrowing animals was observed on either of the abutments or the embankment. Muskrats, according to Mr. Guthrie, have been a problem in the reservoir in the past. The muskrats are generally trapped when present.

c. Project Geology and Soils

(1) Project Geology

The damsite is located on McKinney Creek in the Dissected Till Plains Section of the central Lowland Physiographic Province. Loess-mantled Kansas drift covers the surface of most of the Dissected Till Plains Section. This section is distinguished from the Young Drift Section to the north and from the Till Plains on the east by the stage it has reached in the post-glacial erosion cycle. Broadly generalized, this section is a nearly flat till plain submature to mature in its erosion cycle.

The topography at the damsite is flat to rolling with V- to U-shaped valleys. Elevation of the ground surface ranges from 865 feet above M.S.L. at the damsite to 900 feet above M.S.L. nearly 1 mile northeast of the damsite. The reservoir slopes are in the range of 4^{o} to 10^{o} from the horizontal. The area near the damsite is covered with slope wash deposits of glacial-fluvial and loess origins consisting of mottled yellowish brown to gray, silty clay.

The regional bedrock geology beneath the glacial outwash deposits within the damsite area, as shown on the Geological Map of Missouri (1979) (see Plate 5), consists of Pennsylvanian undifferentiated rocks, Pennsylvanian Marmaton-Cherokee Group rocks (cyclic deposits of shale, limestone and sandstone), Mississippian Burlington Limestone (cherty, grayish brown, sandy limestone), the Mississippian Chouteau Group, the Devonian Sulphur Springs Group (Bushberg Sandstone, Glen Park Limestone and Grassy Creek Shale), and Ordovician rocks consisting of Maquoketa Shale, Kimmswick Limestone, St. Peter Sandstone, Powell Dolomite, and Roubidoux Formation. The

predominant bedrock underlying the glacial-fluvial deposits at the damsite are the Pennsylvanian cyclic deposits of shale, limestone and sandstone of the Marmaton-Cherokee Group. No outcropping of bedrock was seen at the damsite. Inlet and outlet areas of McKinney Creek exhibit Quaternary alluvium.

No faults have been identified at the damsite. The closest trace of a fault in the vicinity of the damsite is the Kingdom City Fault nearly 12 miles south of the damsite. The Kingdom City Fault had its last movement in post-Ordovician time. Thus, the fault has no effect on the damsite.

Guthrie Lake Dam consists of a homogeneous earthfill embankment, a principal spillway pipe located near the maximum section of the embankment, and an emergency spillway located at the left abutment end of the embankment.

No boring logs or construction reports were available which would indicate foundation conditions encountered during the construction. Based on the visual inspection and conversations with the owner, Mr. Guthrie, the embankment probably rests on glacial-fluvial deposits (yellowish brown, silty clay) with a core trench excavated into the glacial-fluvial deposits. The foundation material underneath the principal spillway pipe consists of compacted embankment fill (mottled yellowish brown to gray, silty clay). The emergency spillway was cut into the compacted embankment fill.

(2) Project Soils

According to the "Missouri General Soil Map and Soil Association Description" published by the Soil Conservation Service, the materials in the general area of the dam belong to the soil series of Putnam-Mexico in the Central Claypan Area forest. The soils are basically formed from loess. These soils are mostly a very slowly permeable silty clay.

Materials removed from the upstream and downstream slopes of the embankment appeared to be a mottled yellowish brown to gray, silty clay with traces of fine to coarse sand. Based upon the Unified Soil Classification System, the soil would probably be classified as a CL. This is an impervious soil type that generally has the following characteristics: a coefficient of permeability less than 1.0 foot per year, medium shear strength, and a high resistance to piping.

d. Appurtenant Structures

(1) Principal Spillway

The principal spillway was provided with a metal hood bolted to the top of the pipe at the inlet. This has apparently come loose recently and fallen to the ground. There seems to be no protective coating on the welded steel pipe and the resultant rust appears to be pitting the surface of the pipe (see Photo 5). Also, an object of some kind is lodged about midway inside the pipe.

(2) Emergency Spillway

The emergency spillway has grass and weeds growing within the channel that provide good ground cover; this ground cover, however, is 2 to 3 feet high (see Photos 3, 7, and 8). There is also a relatively small area in the downstream channel where the grass cover is rather sparse and erosion has taken place (see Photo 9). Since the reservoir level is so low, a portion of the reservoir bottom is exposed in front of the spillway inlet area and is being eroded due to surface runoff (see Photo 12).

(3) Outlet Works

There are no low-level outlets or outlet works provided for this dam. However, a portable, diesel-powered centrifugal pump, which cannot be considered an appurtenant structure, is used at the damsite. The pump is operable and is capable of draining the reservoir, according to Mr. Guthrie. The pump was last used during the summer months of 1979.

e. Reservoir Area

The reservoir water surface elevation at the time of the inspection was 852.5 feet above M.S.L.

The surface area of the reservoir at normal water level is about 30 acres. The rim appeared to be stable with no major erosional problems observed. The land around the reservoir slopes gently upward from the rim and is primarily used for agricultural purposes. No houses are built near the reservoir.

f. Downstream Channel

The downstream channel is narrow and well defined, but is obstructed with trees and large vegetation. The floodplain outside of the channel is fairly wide and cleared for agricultural use near the damsite.

3.2 Evaluation

The visual inspection did not reveal any conditions which were felt to pose an immediate threat to the safety of the structure; however, the following conditions do exist that could affect the overall integrity of the dam.

1. The damage to the downstream slope caused by surface runoff, due primarily to the lack of adequate protection on the slope, has the potential to negatively affect the stability of the embankment. Corrective measures have been employed by Mr. Guthrie to control the problem.

2. It is unknown whether the cracks observed on the embankment are indicative of shrinkage, slope movement or foundation settlement. The longitudinal cracks observed at the top of some of the scarps on the downstream slope indicate that future sloughing of the slope is possible. Most of the cracks on the embankment, however, appear to be due to shrinkage judging from the extent and location of them.

3. The erosional problem on the upstream slope due to the lack of adequate slope protection does not appear to be detrimental to the stability of the embankment in its present condition. Because the slope is fairly flat, the surface erosion problem has been lessened to some degree. The reservoir is used to store water for irrigation and since it is anticipated that the water surface shall be drawn down periodically, the slope below the normal water level should also be adequately protected.

4. The small tree observed on the downstream slope does not pose a danger to the safety of the dam at this time. Depending upon the extent of the root system, the roots of large trees present possible paths for piping through the embankment. The root systems can also do damage to the embankment from being uprooted by a storm.

5. Although an adequate vegetative cover is recommended to be retained on the embankment, a tall growth of vegetation on the embankment hinders a comprehensive inspection of the dam and potential problems could go undetected.

6. The object lodged within the central portion of the principal spillway could cause further blockage of the opening, thereby causing reduced capacity of the principal spillway.

7. When the reservoir level reaches an elevation above the top of the principal spillway, the lack of the metal hood could result in a debris-clogged pipe.

8. Although the rust condition of the principal spillway does not seem to pose any severe problems at this time, it will probably get worse, as the dam is only 4 years old.

9. The erosive areas of the downstream portion of the emergency discharge channel would probably not sustain the flows of large excess rainfall and reservoir flows. Due to the location of the erosion, it is possible that further erosion could encroach upon the toe of the dam and endanger the safety of the dam. The tall grass within the emergency spillway channel would contribute to reduced outflow in the event of a large amount of excess overflow.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Guthrie Lake Dam was constructed to impound water for irrigation. There are no set operational procedures other than the procedures described in Section 1.2h, which are implemented only when water for irrigation is required.

4.2 Maintenance of Dam

The dam and appurtenant structures are maintained by the owner, Mr. Robert B. Guthrie. Maintenance is performed as it is required and, according to Mr. Guthrie, the grass cover is being allowed to go to seed so that it can spread into bare areas on the embankment. Several areas of erosion were present on the downstream slope about which Mr. Guthrie expressed some concern. Mr. Guthrie has taken some measures to correct this problem as described above. There is one small tree growing on the downstream slope. A circular steel plate, used as an anti-vortex device at one time was bolted to the top of the principal spillway pipe. The plate has since fallen off of the pipe and, on the day of the inspection, was observed laying on the ground beneath the pipe.

4.3 Maintenance of Operating Facilities

The only operable facility at the damsite is the diesel powered irrigation pump. The pump is portable and is located on the left side of the reservoir. According to Mr. Guthrie, the pump is in good condition and operable.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any existing warning system consisting of any electrical warning systems or manual warning notification plans in effect for this dam.

4.5 Evaluation

The maintenance at Guthrie Lake Dam seems to be adequate and the dam does not appear to be neglected. Nevertheless, the remedial measures described in Section 7 should be undertaken to improve the condition of the dam.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The watershed area of the Guthrie Lake Dam upstream from the dam axis consists of approximately 305 acres. The watershed area is mostly row crops or pasture and range land with some wooded areas. Land gradients in the watershed average roughly 1 percent. The Guthrie Lake Dam Reservoir is located on McKinney Creek. The reservoir is about 1-1/2 miles upstream from the U.S. Highway 54 crossing of McKinney Creek. The watershed at its longest arm is approximately 1 mile long. A drainage map showing the watershed and the downstream hazard zone is presented as Plate 1 in Appendix B.

Evaluation of the hydraulic and hydrologic features of Guthrie Lake Dam was based upon criteria set forth in the Corps of Engineers' "Engineer Regulation No. 1110-2-106" and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometerological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based upon criteria given in the Corps of Engineers' EM 1110-2-1411 (Standard Project Storm). The Soil Conservation Service (SCS) method was used for deriving the unit hydrograph, utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version). The unit hydrograph parameters are presented in Appendix B. The SCS method also was used for determining the loss rate. The hydrologic soil group of the watershed was determined by use of published soil maps. The hydrologic soil group of the watershed and the SCS curve number are presented in

Appendix B. The curve number, unit hydrograph parameters, the PMP index rainfall and the percentages for various durations were direct input to the HEC-1 (Dam Safety Version) computer program to obtain the PMF hydrograph. The computed peak inflows of the PMF and the one-half PMF are 4,844 cfs and 2,422 cfs, respectively.

Both the PMF and the one-half PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. An antecedent storm of 50 percent of the PMF preceded the PMF and an antecedent storm of 25 percent of the PMF, preceded the one-half PMF, each by four days. The reservoir was assumed at the mean annual high water level at the beginning of the antecedent storm. The mean annual high water level for Guthrie Lake was estimated to be at the crest of the principal spillway. The antecedent storms of 50 percent of the PMF and 25 percent of the PMF, when routed through the reservoir, will both leave the reservoir at approximately an elevation of 861.6 feet above M.S.L. at the end of the four-day period. Thus, the reservoir was assumed at an elevation of 861.6 feet above M.S.L. at the start of the routing computation for the PMF, the one-half PMF, and other PMF ratio floods. The peak outflow discharges for the PMF and the one-half PMF are 4,034 and 1,691 cfs, respectively. Both the PMF and the one-half PMF when routed through the reservoir resulted in overtopping of the dam.

The sizes of physical features utilized to develop the stage-outflow relation for the spillway and overtopping of the dam were taken from field notes and sketches prepared during the field inspection. The reservoir elevation-area data were obtained from the U.S.G.S. Kingdom City, Missouri Quadrangle topographic map (7.5 minute series). The reservoir elevation-area curve and the spillway and overtop rating curve are presented as Plates 2 and 3, respectively, in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam must aim at avoiding overtopping the dam. Overtopping is especially dangerous for an earth dam because of its erodable characteristics. The safe hydrologic design of an embankment dam requires a spillway discharge capability combined with an embankment crest height that can handle a very large and exceedingly rare flood without overtopping.

The Corps of Engineers designs dams to safely pass the Probable Maximum Flood that could be generated from the dam's watershed. This is the generally accepted criterion for major dams throughout the world and is the standard for dam safety where overtopping would pose any threat to human life. Accordingly, the hydrologic requirement for safety for this dam is the capability to pass the Probable Maximum Flood without overtopping.

b. Experience Data

It is believed that records of reservoir stage or spillway discharge are not maintained for this site. However, according to Mr. Guthrie, the maximum reservoir level is approximately two feet below the crest of the emergency spillway.

c. Visual Observations

Observations made of the spillway during the visual inspection are discussed in Section 3.1d and evaluated in Section 3.2.

d. Overtopping Potential

As indicated in Section 5.1a, both the Probable Maximum Flood and the one-half Probable Maximum Flood, when routed through the reservoir, resulted in overtopping of the dam. The peak outflow discharges for the PMF and the one-half PMF are 4,034 and 1,691 cfs, respectively. The maximum capacity of the spillway just before

overtopping the dam is 411 cfs. The PMF overtopped the dam by 1.19 feet and the one-half PMF overtopped the dam by 0.6 feet. The total duration of flow over the top of dam is 5.25 hours during the PMF and 2.58 hours during the occurrence of the one-half PMF. The spillway/reservoir system of Guthrie Lake Dam is capable of accommodating a flood equal to approximately 30 percent of the PMF just before overtopping the dam. The reservoir/spillway system of Guthrie Lake Dam will accommodate the one-percent chance flood (100-year flood) without overtopping.

The failure of the dam could cause extensive damage to the property downstream of the dam and possible loss of life. The estimated damage zone extends approximately three miles downstream of the dam. There are twelve dwellings, a commercial building, a bank, a Post Office, a U.S. highway crossing (U.S. 54), and an Interstate highway crossing (I-70) within the damage zone.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no major signs of settlement or distress observed on the embankment or foundation during the visual inspection. Nevertheless, the erosion on the downstream slope, the observed scarps and the longitudinal cracks above the scarps (these are indicative of the possibility of future sloughing) could be detrimental to the stability of the structure. The downstream slope should be properly repaired and the slope properly protected. The minor erosional problem on the upstream slope does not appear to be detrimental to the stability of the dam in its present condition. Nevertheless, continued erosion of the slope can only jeopardize the embankment. The upstream slope should be adequately protected both above and below the normal water surface level. The upstream slope below the normal water surface level requires some sort of protection due to the fact that the water surface is drawn down annually. No adverse effect to the stability of the embankment due to the drawing down of the reservoir was apparent. It was not apparent whether the majority of the cracks on the embankment were due to shrinkage, slope movement or foundation settlement. Therefore, monitoring of the cracks is warranted. In the absence of seepage and stability analyses, no quantitative evaluation of the structural stability can be made.

The spillway system appeared to be structurally stable on the day of the inspection.

b. Design and Construction Data

The hydraulic computations given to the inspection team had a limited use in the assessment of the structural stability of the dam and appurtenant structures. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available. No embankment or foundation soil parameters were available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of the embankment compaction were available for use in a stability analysis.

c. Operating Records

No operating records are available relating to the dam or appurtenant structures. The only operable facility at the damsite is the diesel powered pump used to supply water to the irrigation system. According to Mr. Guthrie, the reservoir level is drawn down annually during the summer months and fills back up during the remaining months of the year except for the year of 1979 as stated previously. The drawing down of the reservoir does not appear to have affected the stability of the dam. The water level on the day of the visual inspection was 7.5 feet below the principal spillway crest. The reservoir level, reportedly, remains full most of the time except for when water is being pumped from the reservoir for irrigation.

d. Post Construction Changes

No post construction changes are known to exist which will affect the structural stability of the dam.

e. Seismic Stability

The dam is located in Seismic Zone 1 (see Plate 7), as defined in "Recommended Guidelines for Safety Inspection of Dams" prepared by the Corps of Engineers, and will not require a seismic stability analysis. An earthquake of the magnitude which would be expected in Seismic Zone 1 will not cause significant distress to a well designed and constructed earth dam. Available literature indicates that no active faults exist near the vicinity of the damsite.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation, however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based upon observations of field conditions at the time of the inspection along with data available to the inspection team.

It is also important to realize that the condition of a dam depends upon numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be an assurance that an unsafe condition would be detected.

a. Safety

The spillway capacity of Guthrie Lake Dam is found to be "Seriously Inadequate". The spillway/reservoir system will accommodate about 30 percent of the PMF without overtopping the dam. The safety of the embankment will be in jeopardy if the dam is overtopped. The embankment itself would be susceptible to erosion due to the high velocity of flow on its downstream slope, which could lead to an eventual failure of the dam.

The dam and appurtenant structures appeared to be in fair condition. However, a quantitative evaluation of the safety of the embankment could not be made in view of the absence of seepage and stability analyses. The present embankment and appurtenant structures, however, reportedly have performed satisfactorily since their construction without failure or evidence of instability. The dam, reportedly, has never been overtopped and no evidence indicating the contrary was observed. The safety of the dam can be improved if the deficiencies described in Sections 3.2 and 6.1a are properly corrected as described in Section 7.2.

b. Adequacy of Information

The hydraulic computations were of limited use to the overall assessment of the dam and appurtenant structures. The conclusions presented in this report are primarily based upon field measurements and present condition of the dam. Information on the operation and maintenance of the dam was not available except for the information received from Mr. Guthrie. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future. The items recommended in paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II Inspection

Based upon results of the Phase I inspection, and assuming that the remedial measures recommended in Paragraph 7.2 are undertaken, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. Alternatives

There are several general options that may be considered to reduce the possibility of dam failure or to diminish the harmful aspects of such a failure. Some of these options are:

1. Increase the spillway capacity to pass the PMF without overtopping.
2. Increase the height of the dam enough to pass the PMF without overtopping the dam; an investigation should be done that also includes studying the effects on the structural stability of the existing embankment. The overtopping depth during the occurrence of the PMF, stated in Section 5.1d, is not the required or recommended increase in the height of the dam.
3. A combination of 1 and 2 above.

b. O & M Procedures

1. The damage to the downstream slope (surface erosion, scarps and cracks) should be properly repaired and the slope adequately protected. (Measures to correct this condition are being implemented at this time by Mr. Guthrie.)

2. The observed cracking on the embankment should be monitored to ensure that it is not symptomatic of distress in the slopes or foundation. Large cracks should be properly repaired.

3. The upstream slope above the normal water surface level should be adequately protected against surface runoff. (Measures to correct this condition are being implemented at this time by Mr. Guthrie.)

4. The upstream slope below the normal water surface level should also be protected against surface erosion.

5. The small tree on the downstream slope should be removed from the slope and regrowth prevented.

6. The vegetative growth on the embankment should be properly maintained and an adequate vegetative cover retained on the embankment to protect it from surface erosion.

7. The metal hood should be permanently and properly reattached to the inlet end of the principal spillway.

8. The rusting of the principal spillway pipe should be monitored and repairs made when deemed necessary.

9. The object lodged in the central part of the principal spillway pipe should be removed.

10. The tall grass within the emergency spillway discharge channel should be maintained at a lower height, e.g. a 1-foot maximum. The erosion near the end of the discharge channel should be repaired to the extent that it would not further erode in the event of a large flow in the channel and the entire spillway channel adequately protected to avoid excessive erosion during flows through the spillway.

11. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of earth dams.

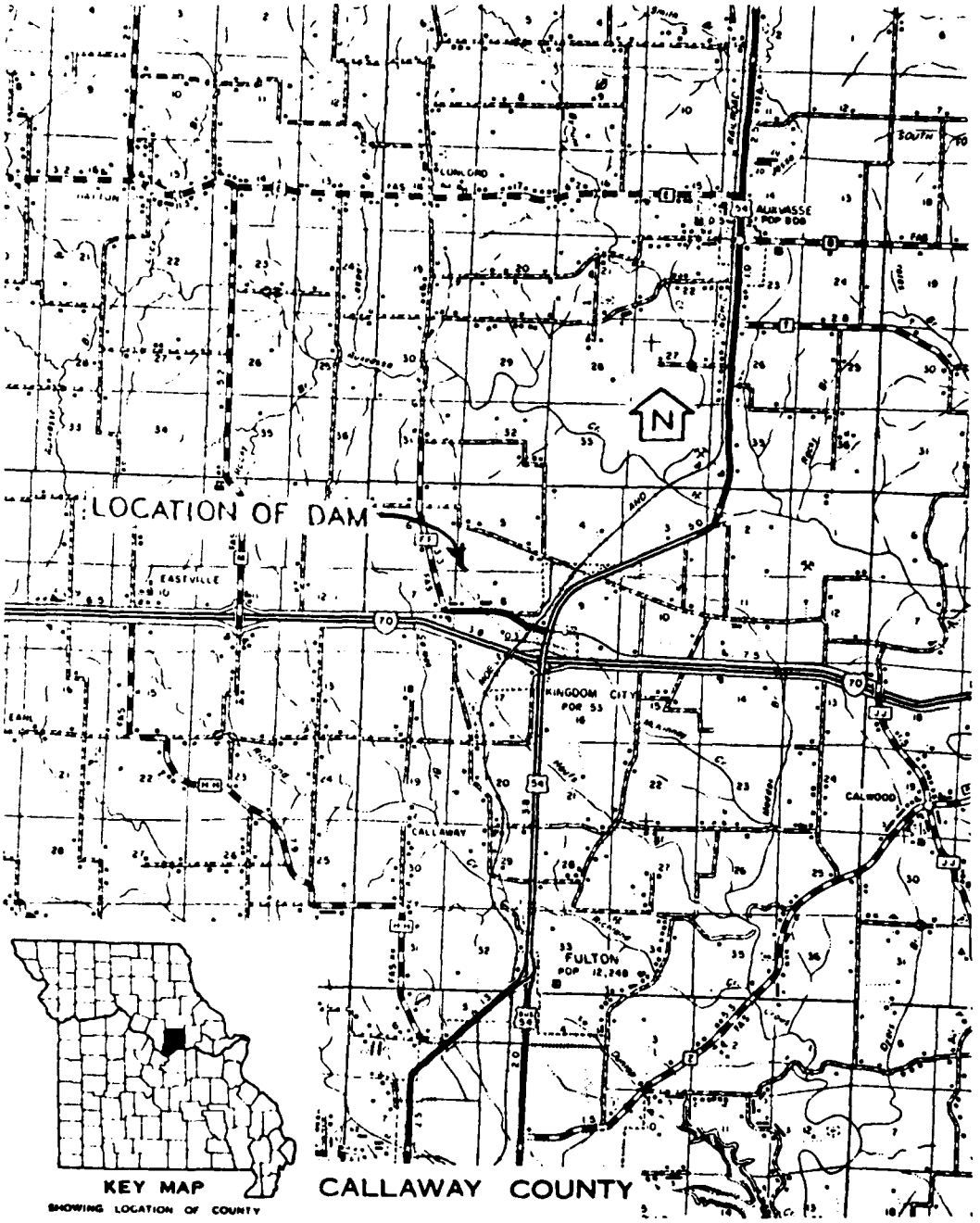
12. The owner should initiate the following programs:

(a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

(b) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

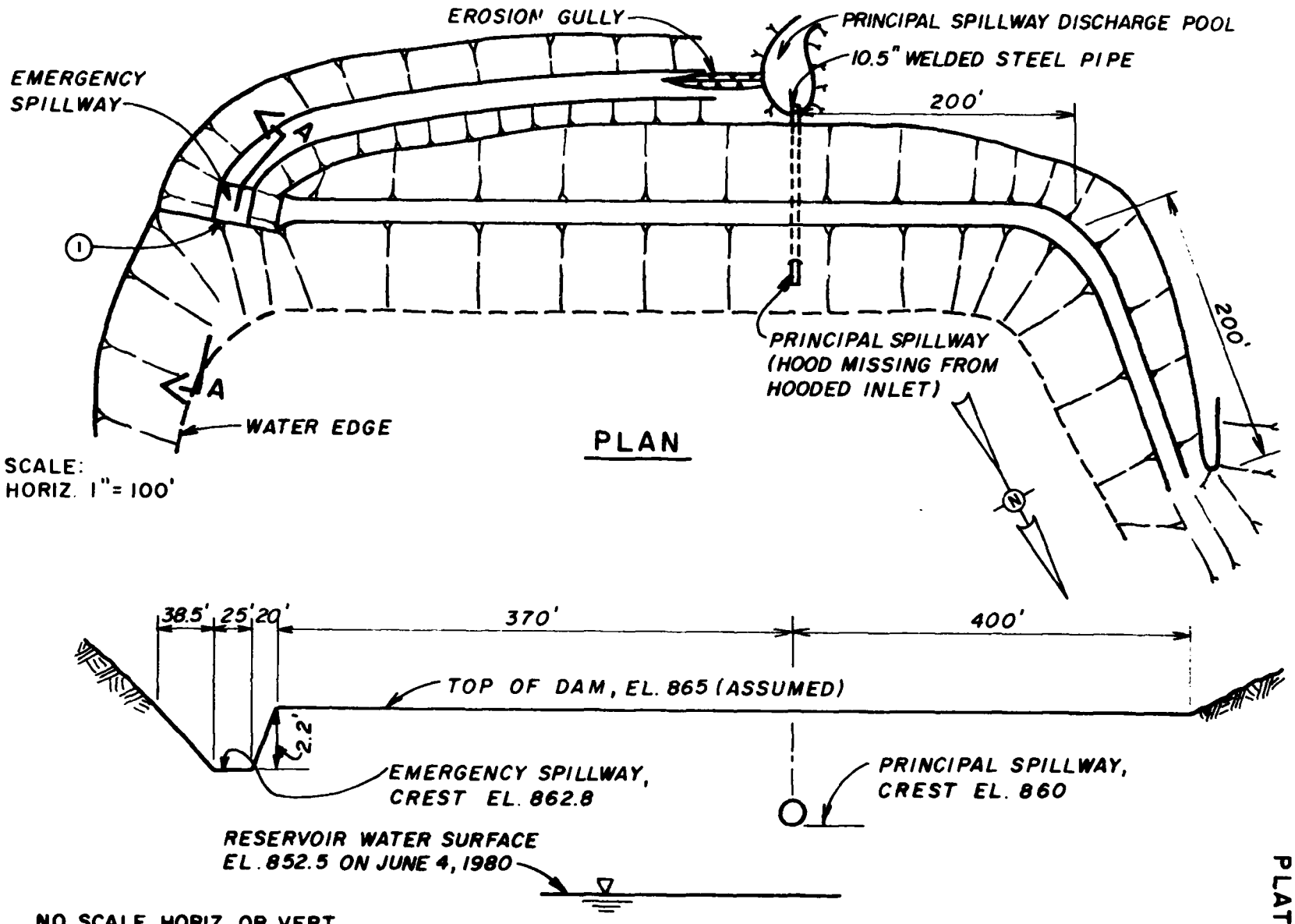
PLATES

PLATE 1



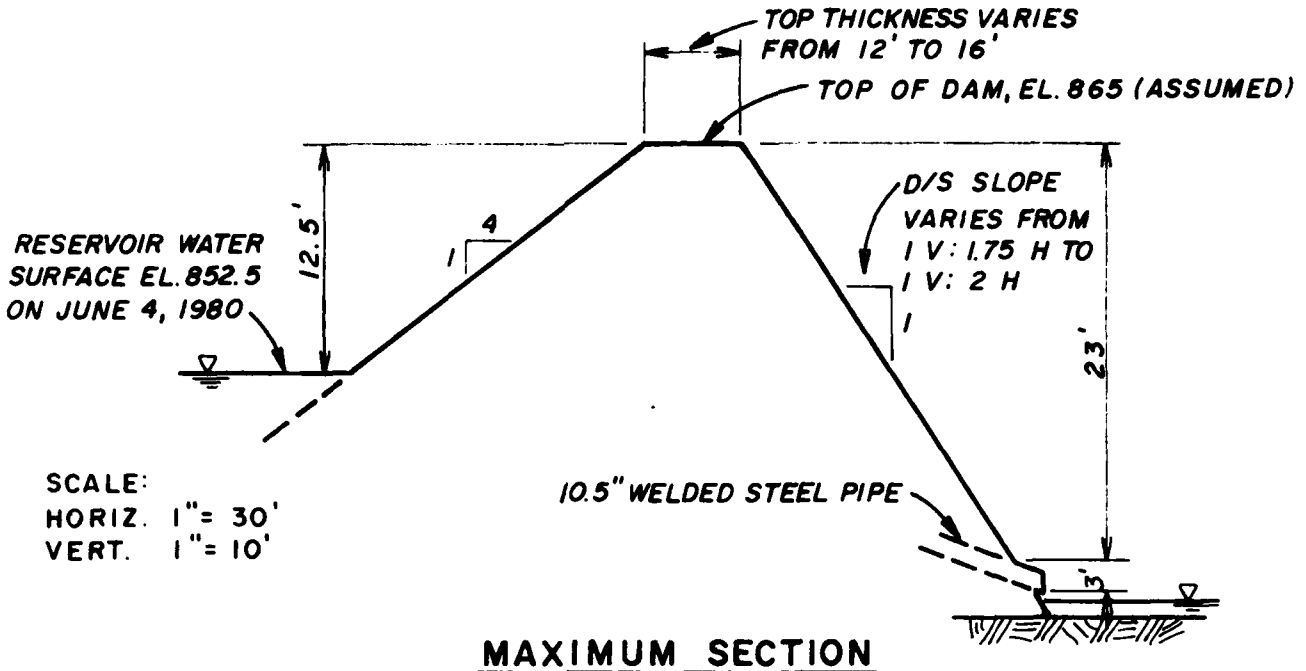
LOCATION MAP – GUTHRIE LAKE DAM

MO 10990

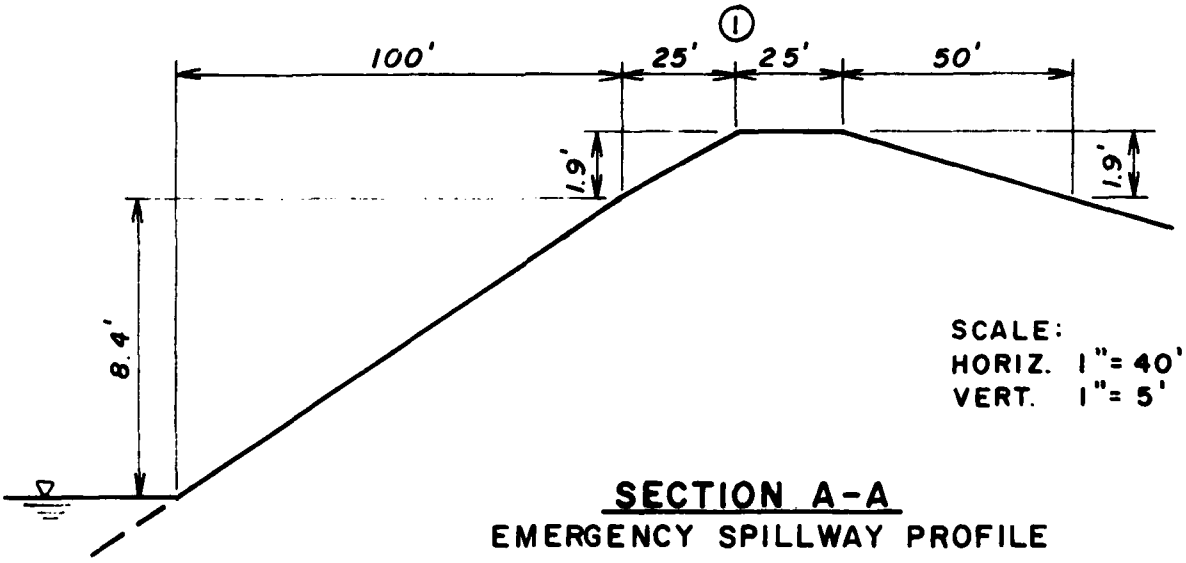


GUTHRIE LAKE DAM (MO. 10990)
PLAN AND ELEVATION
(SHEET 1 OF 2)

PLATE 2



MAXIMUM SECTION



SECTION A-A
EMERGENCY SPILLWAY PROFILE

① *REFERENCE POINT, SEE SHEET 1 OF 2*

GUTHRIE LAKE DAM (MO. 10990)
MAXIMUM SECTION OF EMBANKMENT AND EMERGENCY SPILLWAY PROFILE
(SHEET 2 OF 2)

PLATE 4

RESERVOIR DESIGN

LANDOWNER Kinson & Guthrie LOCATION Gallway

DESIGN BY DS 1-26-76 CHECKED BY _____ DATE _____

DRAINAGE AREA 325 ACRES ENGINEERING REQUEST NO. _____

PRODUCT OF FACTORS = L I T V S C P
— X 1.1 X .83 X 1.0 X — X — X — = .91

Q_{10}= 555 cfs. Vx1= 1.1 HEIGHT X STORAGE = 6167

PRINCIPAL SPILLWAY DESIGN

Principal Elev.= 926.0

10 Year Frequency

Q_{ip}= ____ x ____ cfs.= 555 cfs.

V_{rp}= .175 x 325 ac.= 56.9 ac.ft.

Design - Storage

V_{sp}= 59.1 ac.ft. $\frac{V_{sp}}{V_{rp}}$ = _____

Q_{op}= ____ x ____ cfs.= ____ cfs.

Conduit Dia.= _____ Length= ____

Head= ____ ft. Min.Head= ____ ft.

Capacity= ____ cfs. Stage= ____

Design - Pipe

$\frac{Q_{op}}{Q_{ip}}$ = _____

V_s= ____ x ____ ac.ft.= ____ ac.ft.

Anti-Seep Collars

Length=(____-20) $\begin{matrix}(.10)\\(.15)\end{matrix}$ = _____

USE 1 2 ____ x ____ collars 3

EMERGENCY SPILLWAY DESIGN

Emergency Elev.= _____

50 Year Frequency

Q_i= 1.5 x 555 cfs.= 832 cfs.

V_r= .26 x 325 ac.= 84.5 ac. ft.

Control Section

Depth of Flow= 1.0 ft. V_s= 74.7 ac.ft.

$\frac{V_s}{V_r}$ = _____ $\frac{Q_{op}}{Q_i}$ = _____ %

Q_{oc}= ____ cfs. x ____ = ____ cfs.

Bottom Width= _____ ft.

Outlet Section

S= ____ % Veg.= fair,good,excellent

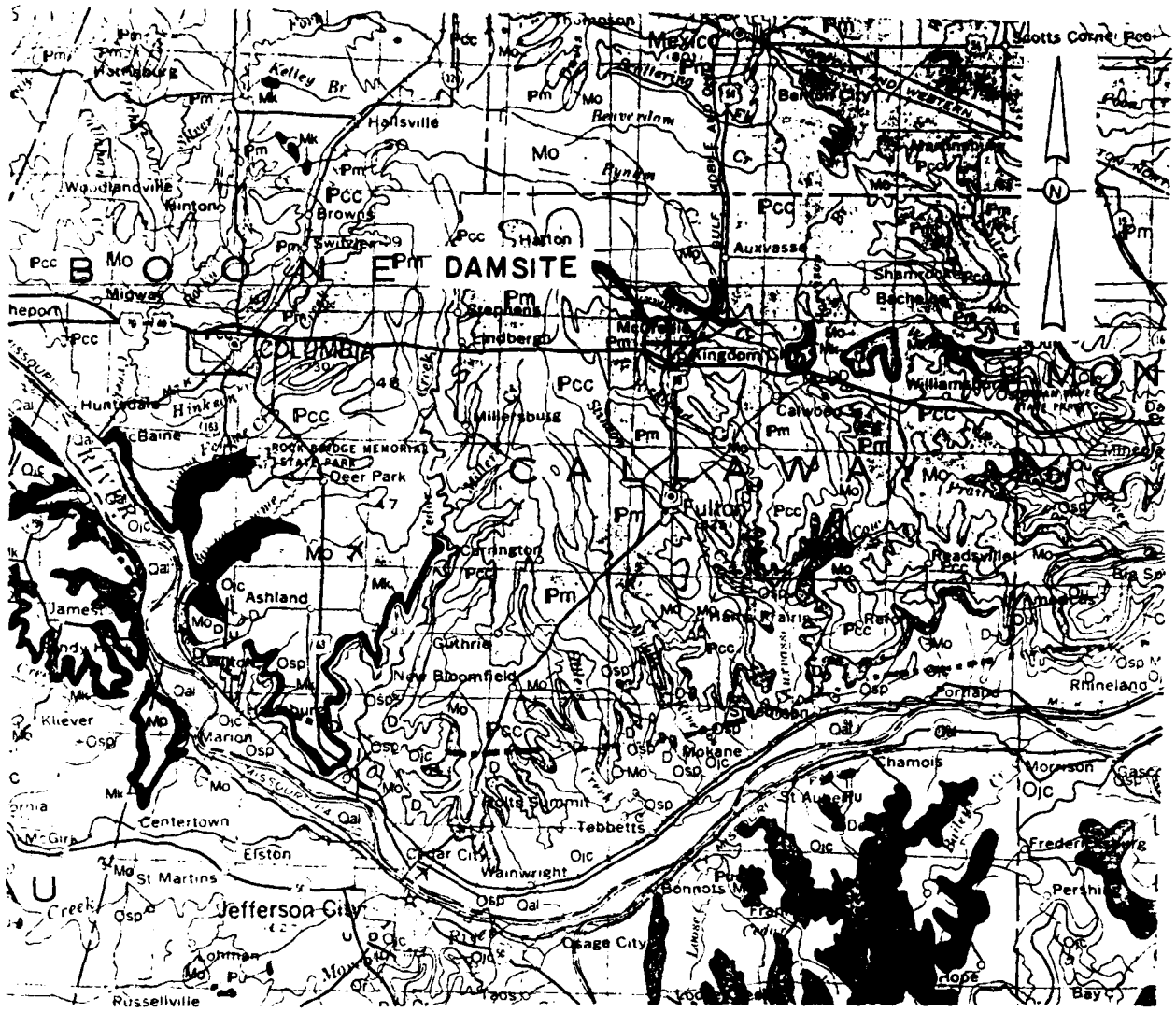
(Less) (More) erosive soils Depth= ___ ft.

Perm. Vel.= ____ fps. Design Vel.= ___ fps.

Width _____ ft.

Total Depth of Spillway= _____ ft.

Top of Dam Elev.= _____



SCALE

10 0 10 20 30 40 Miles

⊕ LOCATION OF DAM

NOTE: LEGEND OF THIS DAM IS ON PLATE 6

REFERENCE:

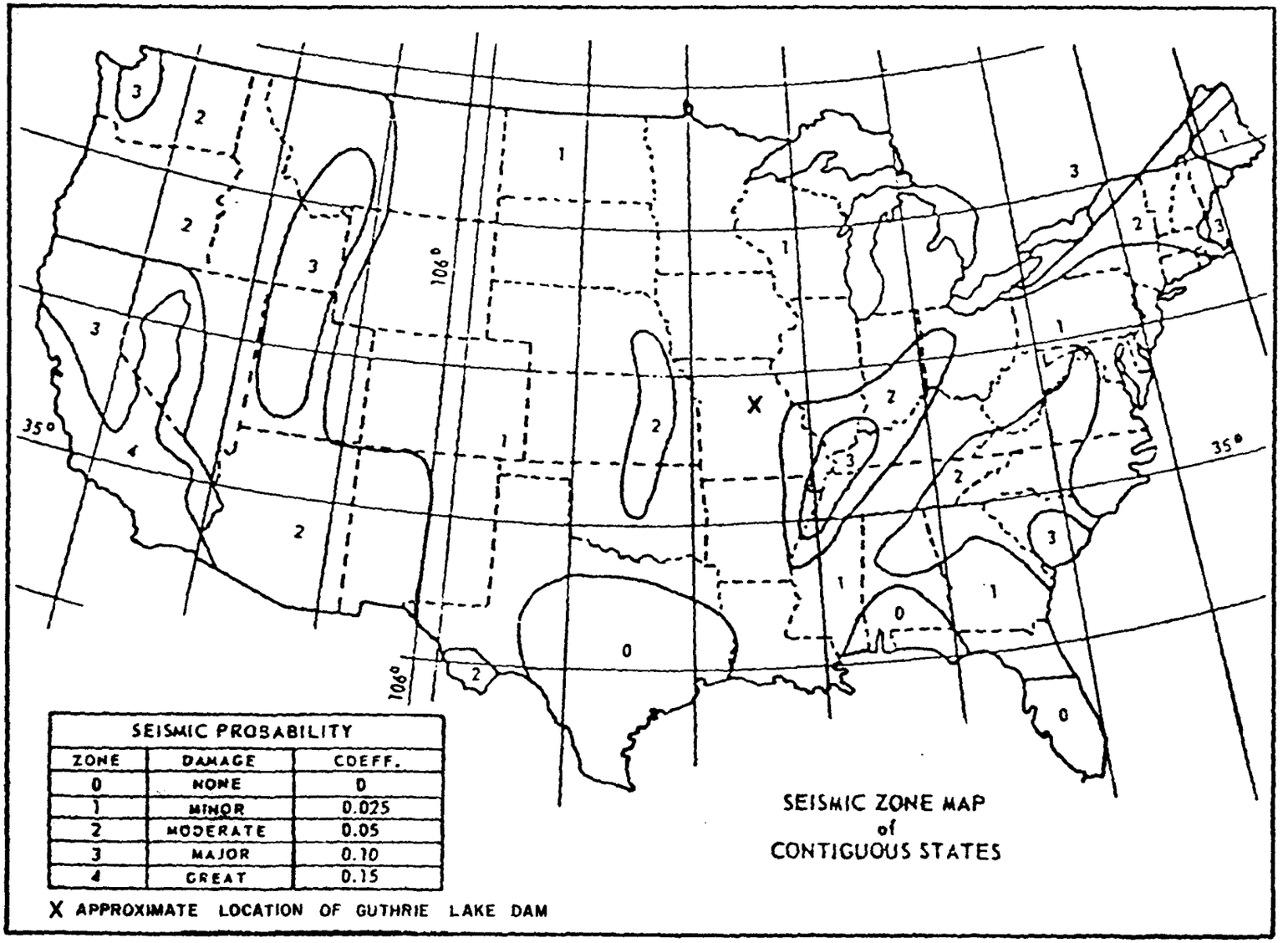
GEOLOGIC MAP OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI GEOLOGICAL SURVEY
KENNETH H. ANDERSON, 1979

REGIONAL GEOLOGICAL MAP OF GUTHRIE LAKE DAM

GUTHRIE LAKE DAM
PLATE 6

LEGEND

PERIOD	SYMBOL	DESCRIPTION
QUATERNARY	Qal	ALLUVIUM: SAND, SILT, GRAVEL
PENNSYLVANIAN	Pu	PENNSYLVANIAN UNDIFFERENTIATED
	Pm	MARMATON GROUP: CYCLIC DEPOSITS OF SHALE, LIMESTONE AND SANDSTONE
	Pcc	CHEROKEE GROUP: CYCLIC DEPOSITS OF SHALE, LIMESTONE AND SANDSTONE
MISSISSIPPIAN	Mo	KEOKUK- BURLINGTON FORMATION: CHERTY GRAYISH BROWN SANDY LIMESTONE
	Mk	CHOUTEAU GROUP: BACHELOR, AND HANNIBAL FORMATION (LIMESTONE AND SHALE)
DEVONIAN	D	SULPHUR SPRING GROUP: BUSHBERG SANDSTONE, GLEN PARK LIMESTONE, GRASSY CREEK SHALE
ORDOVICIAN	Ou	MAQUOKETA SHALE, KIMMSWICK LIMESTONE
	Osp	ST PETER SANDSTONE
	Ojc	SMITHVILLE FORMATION, POWELL DOLOMITE
	Or	ROUBIDOUX FORMATION: LIMESTONE AND SANDSTONE



SEISMIC PROBABILITY		
ZONE	DAMAGE	COEFF.
0	NONE	0
1	MINOR	0.025
2	MODERATE	0.05
3	MAJOR	0.10
4	GREAT	0.15

X APPROXIMATE LOCATION OF GUTHRIE LAKE DAM

SEISMIC ZONE MAP
of
CONTIGUOUS STATES

PLATE 7

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

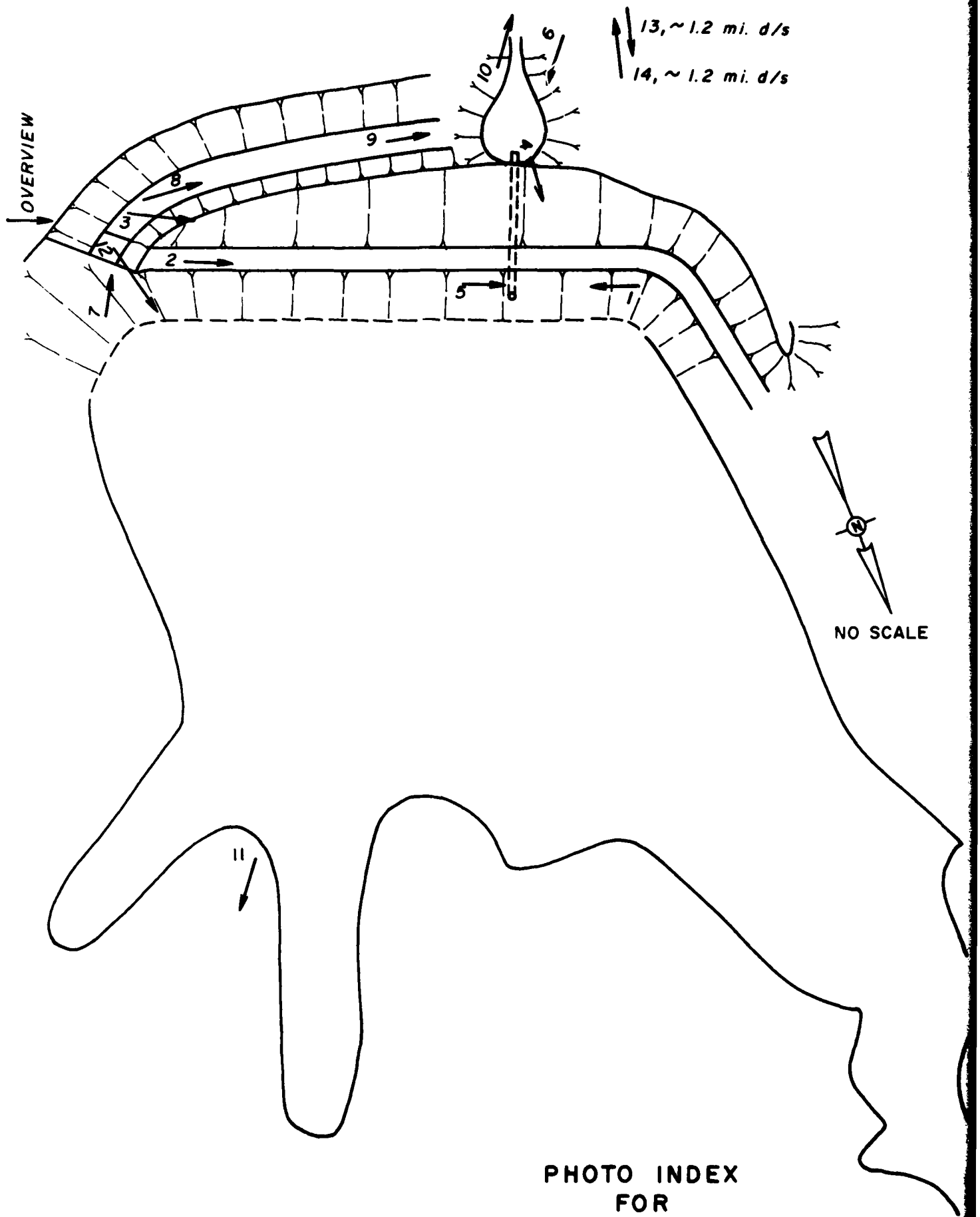


PHOTO INDEX
FOR
GUTHRIE LAKE DAM

Guthrie Lake Dam

Photographs

Photo 1 - View of the upstream slope looking toward the left abutment showing the sparse vegetation and the inlet to the principal spillway.

Photo 2 - View of the top of dam showing the tall grass cover.

Photo 3 - View of the downstream slope which also shows the curvature of the embankment in the background.

Photo 4 - View of erosional gullies and the sparse vegetation cover on the downstream slope in the area near the principal spillway.

Photo 5 - View of the principal spillway inlet showing the rusting of the pipe. Note, circular steel plate used as an anti-vortex device is shown in the lower right hand corner of Photo.

Photo 6 - View of the principal spillway outlet showing the discharge pool.

Photo 7 - View of the control section of the emergency spillway looking downstream.

Photo 8 - View of the discharge channel for the emergency spillway.

Photo 9 - View of the erosion gully at the confluence of the emergency spillway discharge channel and the principal spillway discharge pool. Note, the person in the Photo is at the principal spillway pipe.

Photo 10 - View of the downstream channel showing the obstruction of trees and brush.

Photo 11 - View of the diesel powered, centrifugal pump.

Photo 12 - View of the reservoir and rim.

Photo 13 - View of a Post Office located approximately 1.2 miles downstream of the dam. The downstream channel (McKinney Creek) is in the background.

Photo 14 - View of a commercial bank located approximately 1.2 miles downstream of the dam. The downstream channel (McKinney Creek) is shown on the right hand side of the Photo.

Photo 1

Photo 2

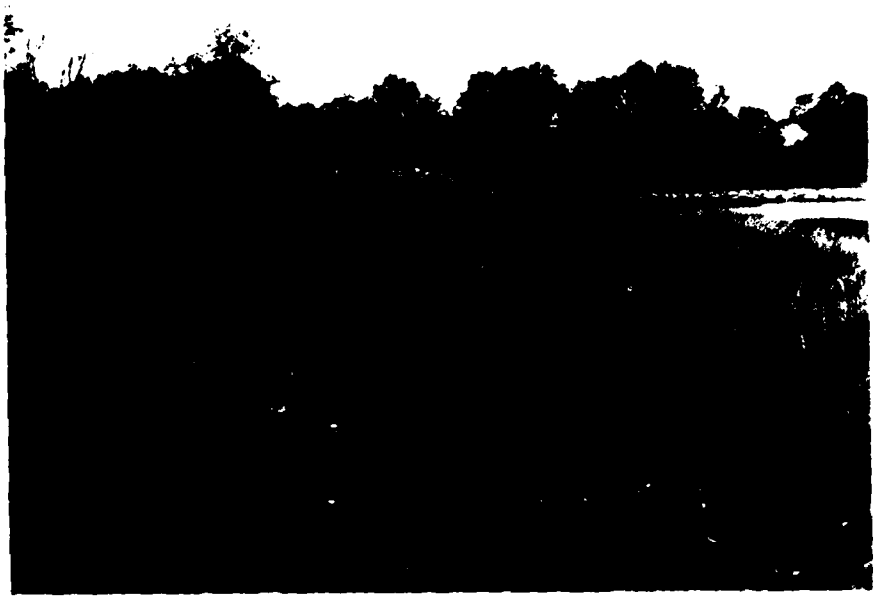


Photo 3

Photo 4

Photo 5

Photo 6

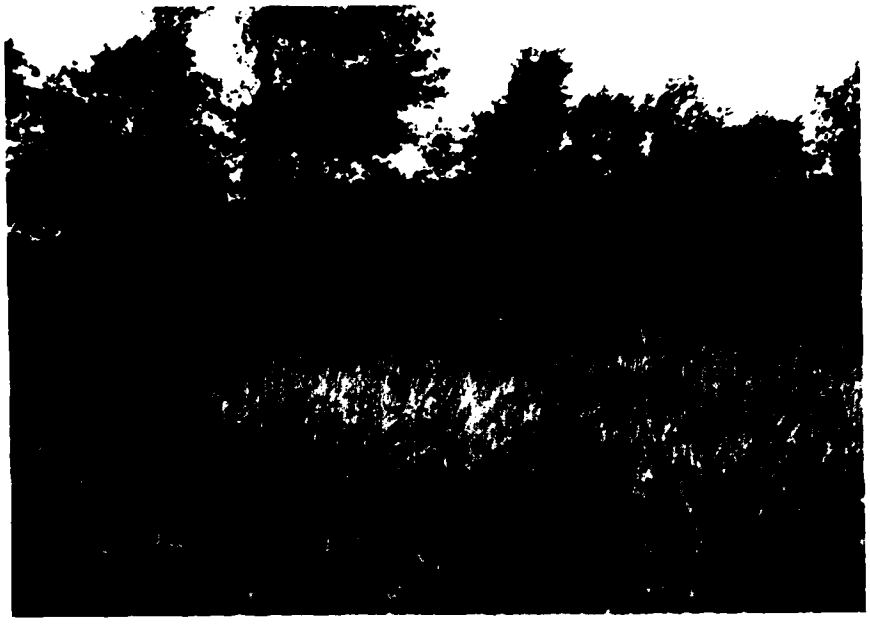


Photo 7

Photo 8

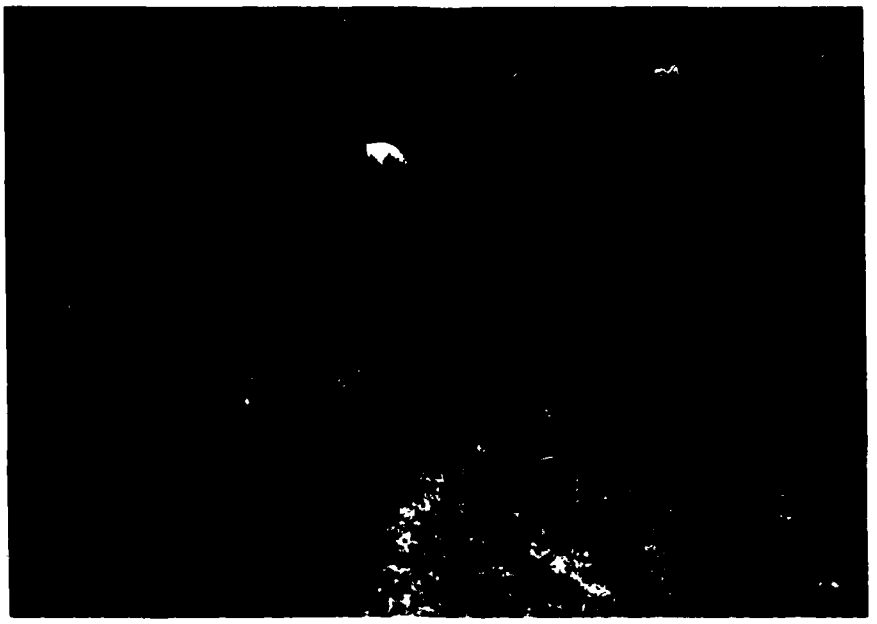


Photo 9

Photo 10

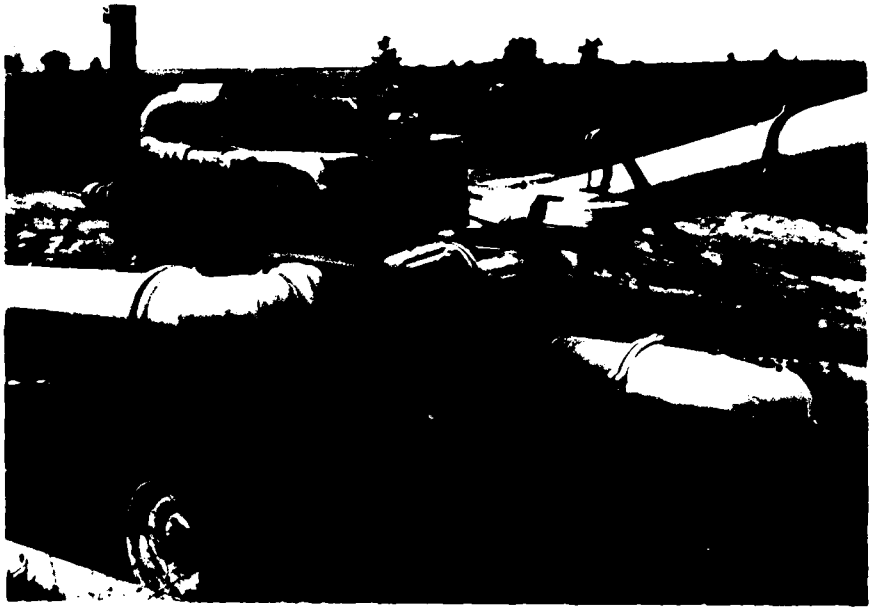


Photo 11

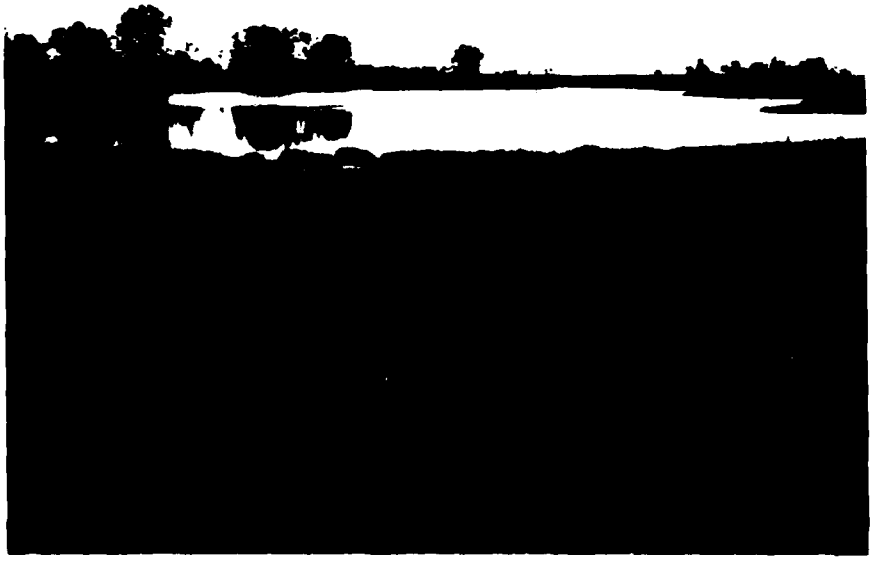


Photo 12

Photo 13

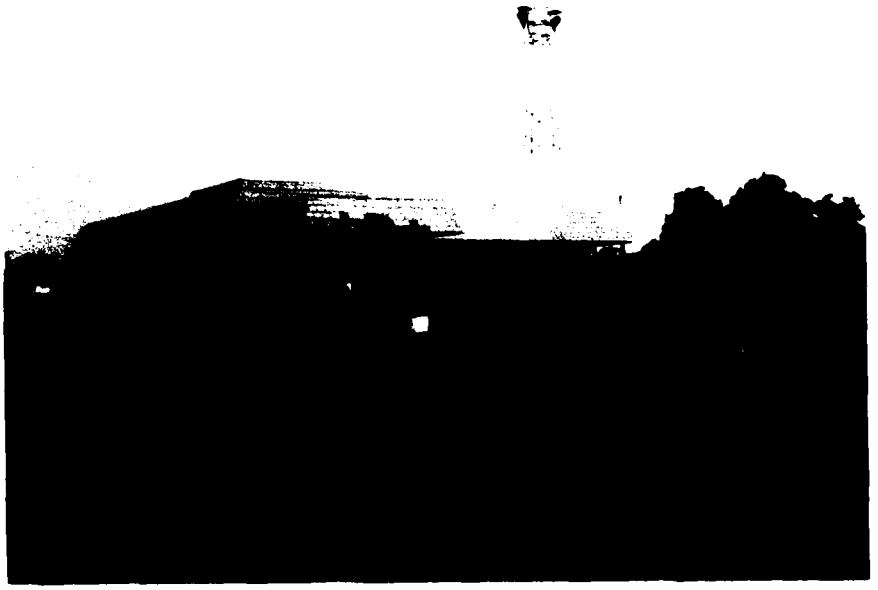
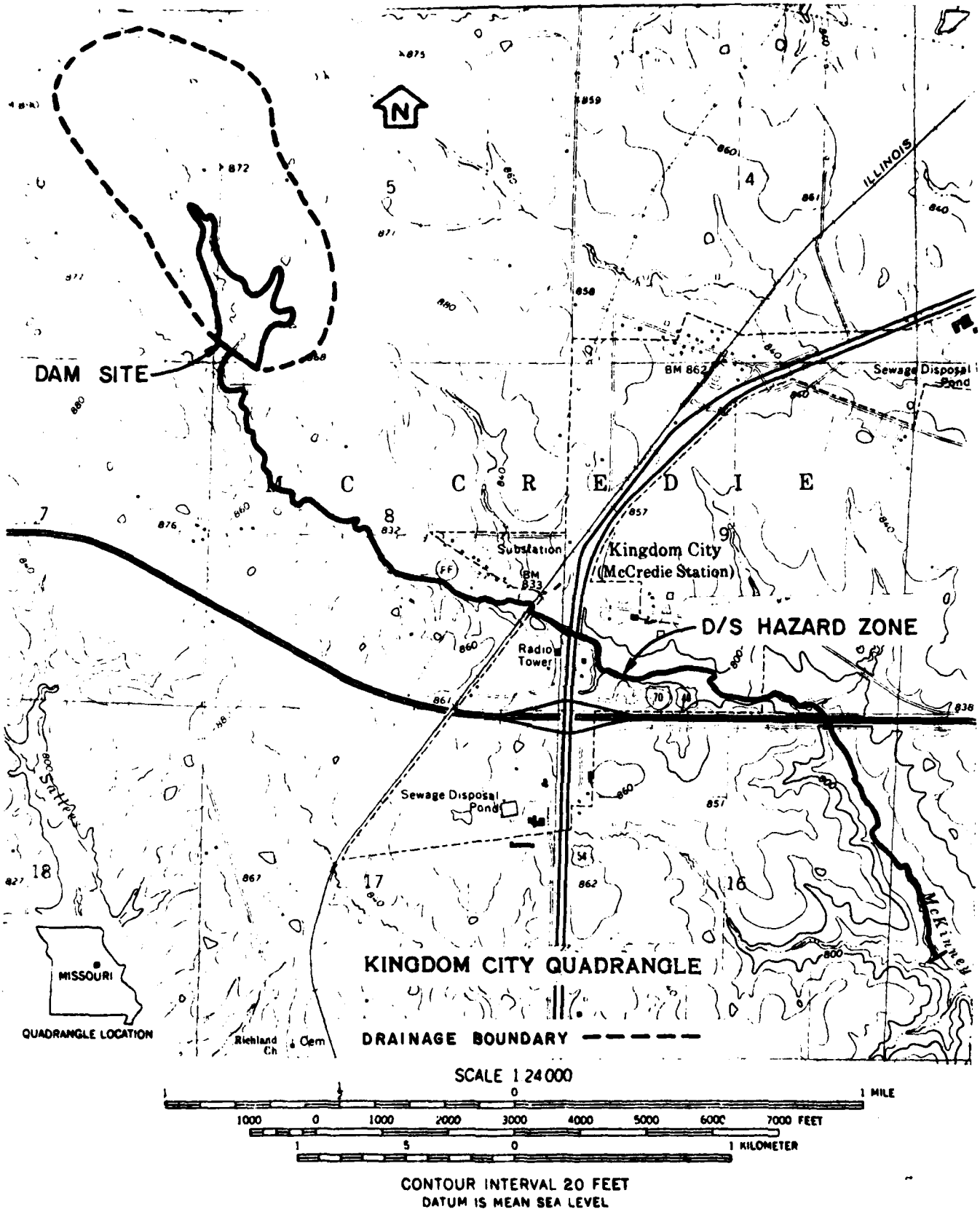


Photo 14

APPENDIX B

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

PLATE I, APPENDIX B



GUTHRIE LAKE DAM (MO. 10990)
DRAINAGE BASIN AND DOWNSTREAM HAZARD ZONE

ECI-4 **PRC ENGINEERING CONSULTANTS, INC.**

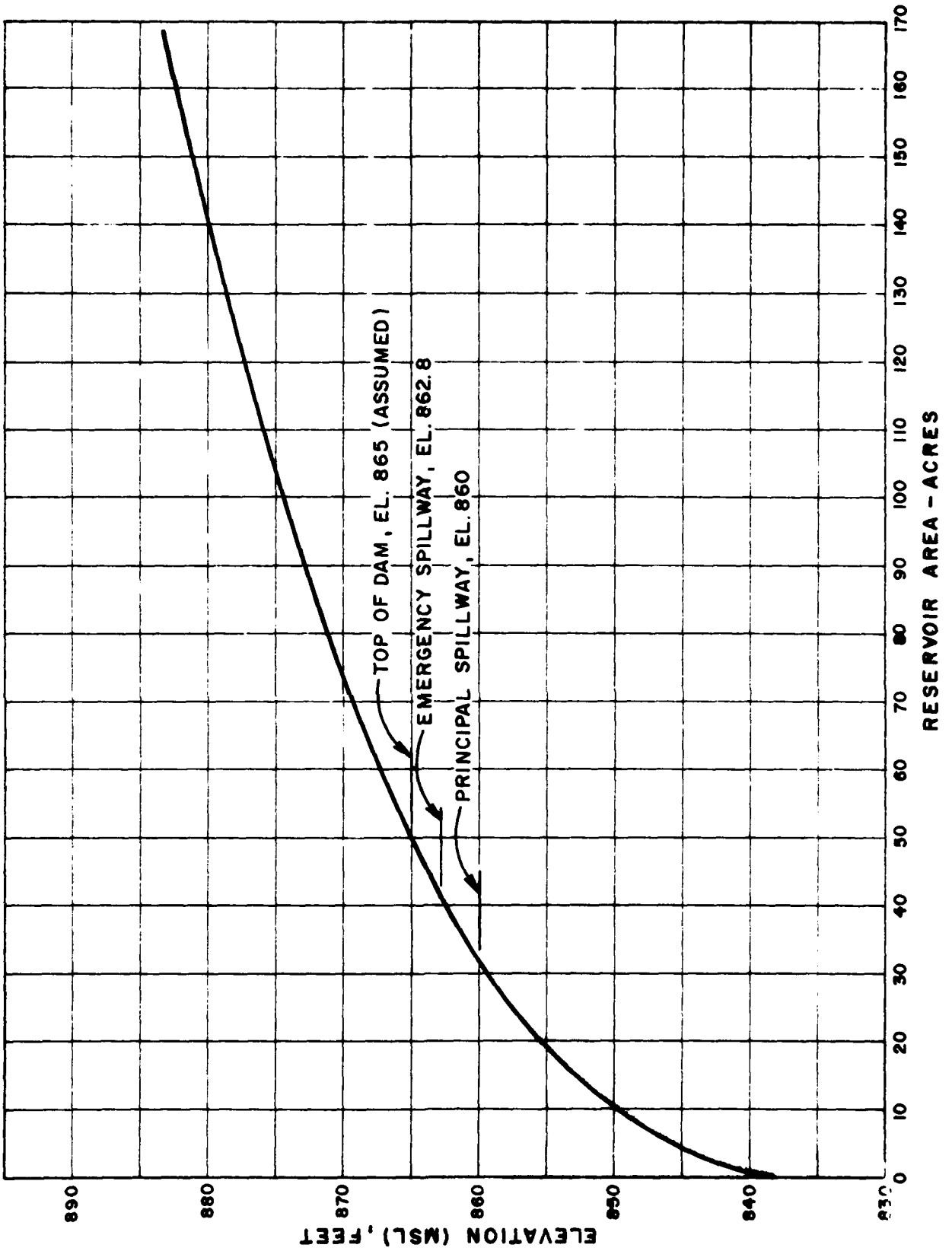
DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF 1

DAM NAME: GUTHRIE LAKE DAM ID NO.: 10990 JOB NO. 1263

RESERVOIR ELEVATION - AREA DATA BY [illegible] DATE 6/30

ELEV. (M.S.L.) (Ft.)	RESERVOIR SURFACE AREA (Acres)	REMARKS
[illegible]	0	Estimated stream bed at dam
[illegible]	10.5	Interpolated
[illegible]	30.0	Principal Spillway
[illegible]	41.5	Emergency Spillway
[illegible]	50.0	Top of Dam (Assumed)
[illegible]	111.0	Interpolated
[illegible]	141.0	Measured from USGS Map

PLATE 2, APPENDIX B



GUTHRIE LAKE DAM (MO. 10990)
RESERVOIR ELEV.- AREA CURVE

PRC ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI — SHEET NO. ___ OF ___

DAM NAME: GUTHRIE LAKE DAM (MO. 10990) — JOB NO. 1263

UNIT HYDROGRAPH PARAMETERS — BY RJT KLA DATE 6/30

1) DRAINAGE AREA, A = .476 sq. mi = (305 acres)

2) LENGTH OF STREAM, L = (1.4 " x 2000' = 2800') = .53 mi.

3) ELEVATION AT DRAINAGE DIVIDE ALONG THE LONGEST STREAM,

$H_1 = 895$

4) ELEVATION OF RESERVOIR AT SPILLWAY CREST, H_2 = 840

5) ELEVATION OF CHANNEL BED AT 0.85L, E_{85} = 890

6) ELEVATION OF CHANNEL BED AT 0.10L, E_{10} = 845

7) AVERAGE SLOPE OF THE CHANNEL, $S_{AVG} = (E_{85} - E_{10})/0.75L = 0.012$

8) TIME OF CONCENTRATION:

A) BY KIRPICH'S EQUATION,

$t_c = [(11.9 \times L^3)/(H_1 - H_2)]^{0.385} = [11.9 \times (0.53)^3/(895-840)]^{0.385} = 0.32$ hrs

B) BY VELOCITY ESTIMATE,

SLOPE = 1.2% ⇒ AVG. VELOCITY = 2 fps

$t_c = L/V = 2800'/(2 \times 3600) = 0.39$ hrs

USE t_c = 0.32 hrs.

9) LAG TIME, $t_l = 0.6\, t_c = 0.19$ hrs

10) UNIT DURATION, $D \leq t_l/3 = .06$ hrs < 0.083 hr

USE D = .083 hr.

11) TIME TO PEAK, $T_p = D/2 + t_l = 0.23$ hrs

12) PEAK DISCHARGE,

$q_p = (484 \times A)/T_p = 484 \times 0.476/0.23 = 1000$ cfs ✓

FNC ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. ____ OF ____

DAM NAME: GUTHRIE LAKE DAM (10990) JOB NO. 1263

CURVE NUMBER DETERMINATION BY [illegible] DATE 6/30

I) SOIL GROUP

WATERSHED SOILS IN THE BASIN CONSIST OF:

PUTNAM (GRD), MEXICO (GRD)

GROUP D SOILS SEEM TO PREDOMINATE THE BASIN. THEREFORE, ASSUME GROUP D SOILS FOR THE ENTIRE WATERSHED FOR HYDROLOGIC PURPOSES.

II) COVER COMPLEX

ASSUMED LAND USE	ASSUMED HYDROLOGIC CONDITION	PER CENT AREA	CN (AMC II)
WOODS	FAIR	5	79
PASTURE	FAIR	35	84
ROW CROPS (CONTOURED)	GOOD	60	86

III) CURVE NUMBER

WEIGHTED AVERAGE CN = 85 FOR AMC II

CURVE NUMBER = 94 FOR AMC III

ECI-4 **PRC ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION / MISSOURI — SHEET NO. ____ OF ____

DAM NAME: GUTHRIE LAKE DAM (10990) — JOB NO. 1263

PROBABLE MAXIMUM PRECIPITATION — BY LJT MLB DATE 6/30

DETERMINATION OF PMP

1) Determine drainage area of the basin

D.A. = .476 sq mi (304.5 acres)

2) Determine PMP Index Rainfall (for D.A. = 200 sq. mi. & 24 hr. duration)

Location of centroid of basin,

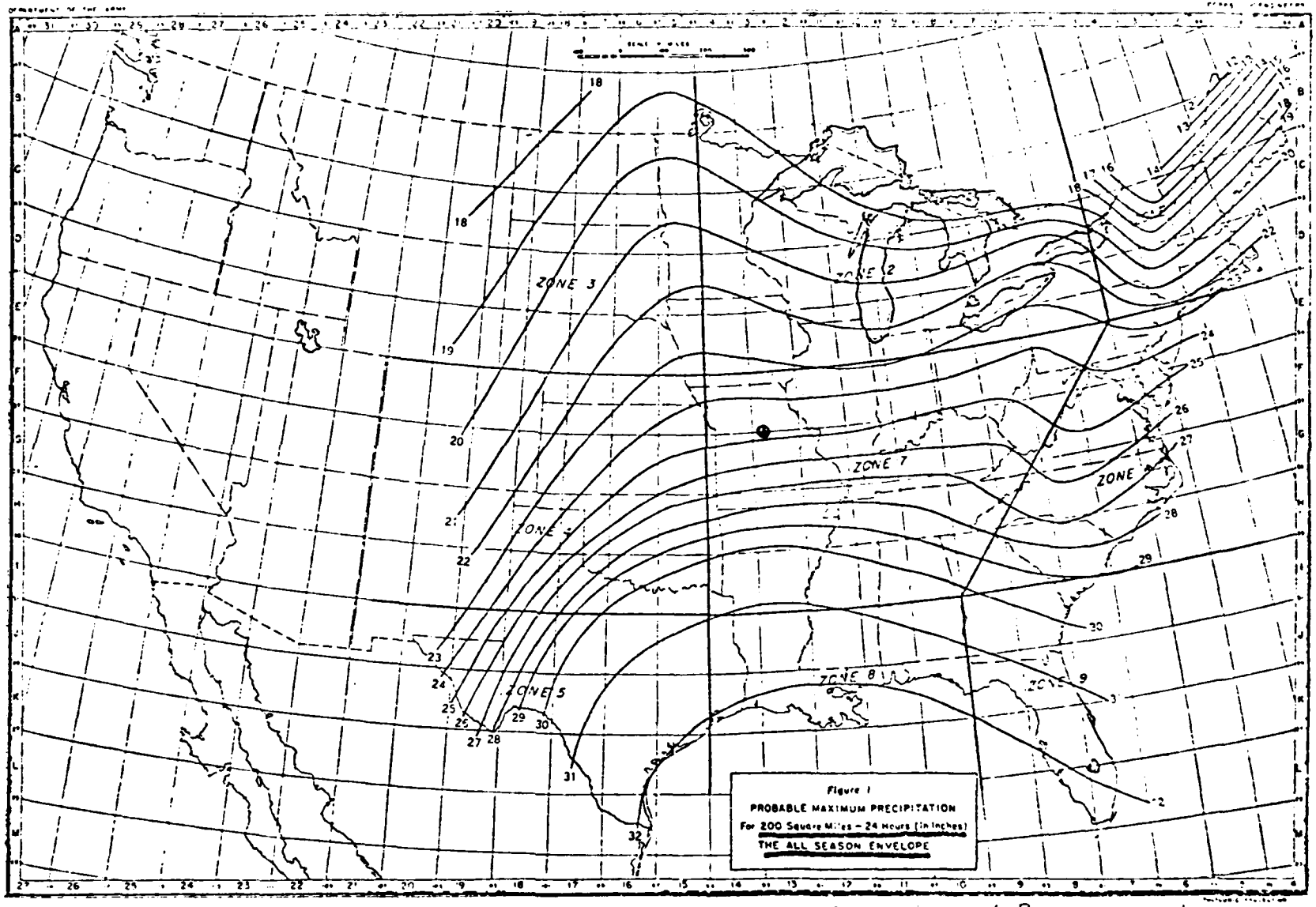
Long. = 91° 57' 36" Lat. = 38° 57' 59"

PMP = 24.8" (from Fig. 1, HMR 33)

Zone = 7

3) Determine basin rainfall in terms of percentage of PMP Index Rainfall for various durations. (from Fig. 2, HMR 33)

Duration (Hrs.)	Percent of Index Rainfall (%)	Total Rainfall (Inches)	Rainfall Increments (Inches)	Duration of Increment (Hrs.)
6	100	24.8"	24.8	6
12	120	29.8"	5.0	6
24	130	32.2"	2.4	12



⊕ Location of Basin

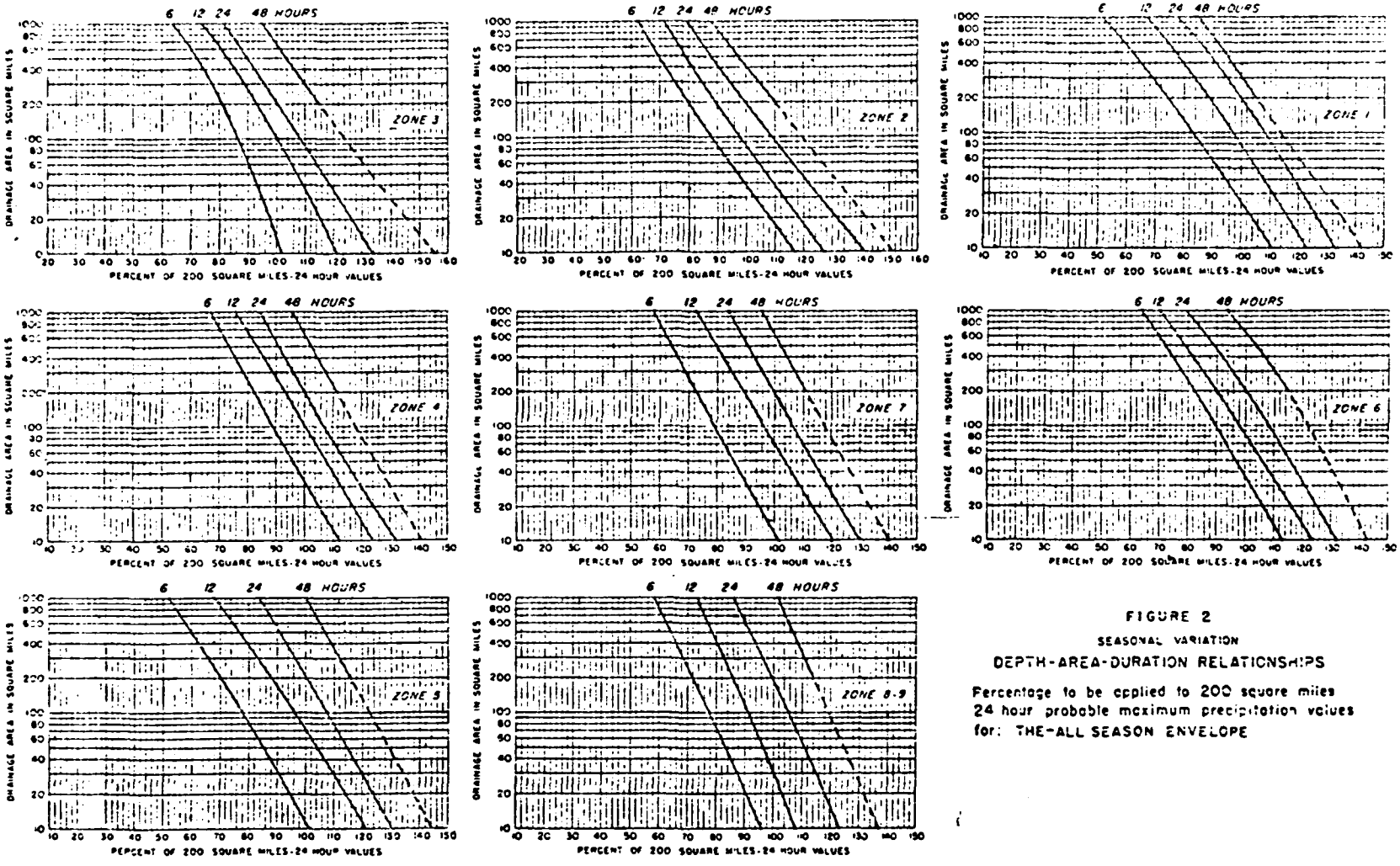


FIGURE 2

SEASONAL VARIATION

DEPTH-AREA-DURATION RELATIONSHIPS

Percentage to be applied to 200 square miles 24 hour probable maximum precipitation values for: THE-ALL SEASON ENVELOPE

EC-4 **PRC ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. 1 OF 4

GUTHRIE LAKE DAM (MO. 10990) JOB NO. 1263

PRINCIPAL SPILLWAY RATING CURVE DEVELOPMENT BY JFK DATE 7/3/80

WEIR FLOW:

h/D	Q/D^5/2	Q	h	W.S. ELEV
0	0	0	0	860
0.2	0.16	0.12	0.18	860.18
0.4	0.46	0.33	0.35	860.35
0.6	0.88	0.63	0.53	860.53
0.8	1.56	1.12	0.70	860.70
1.0	2.20	1.58	0.88	860.88
1.1	2.50	1.79	0.96	860.96
1.2	2.80	2.00	1.05	861.05

BETWEEN WEIR FLOW AND PRESSURE FLOW:

$$\frac{h}{D} = 1.1 + 0.025\,(Q/D^{5/2} - 2.5) \quad \text{, for } D = 0.875$$

$$Q = (h - 0.9078)\,32.74$$

W.S. ELEV	h	Q
861.1	1.1	6.29
861.2	1.2	9.57
861.4	1.4	16.11
861.6	1.6	22.66
861.8	1.8	29.21
862.0	2.0	35.75
862.2	2.2	42.31

PRESSURE FLOW: Follows SCS TECHNICAL RELEASE NO. 3 FOR MODIFIED INLETS

$$Q = A\sqrt{\frac{2gH}{\Sigma K}} \quad \text{, where}$$

$K_{entrance} = 1.0$

$K_{exit} = 1.0$

$K_{friction} = 29.1\,\frac{n^2 L}{R^{4/3}} = 29.1\,(0.012)^2\,92 \,/\, (0.875/4)^{4/3} = 2.78$

$$Q = 0.6\sqrt{\frac{2gH}{4.78}} = 2.21\sqrt{H}$$

EC1-4 **PRC ENGINEERING CONSULTANTS, INC.**

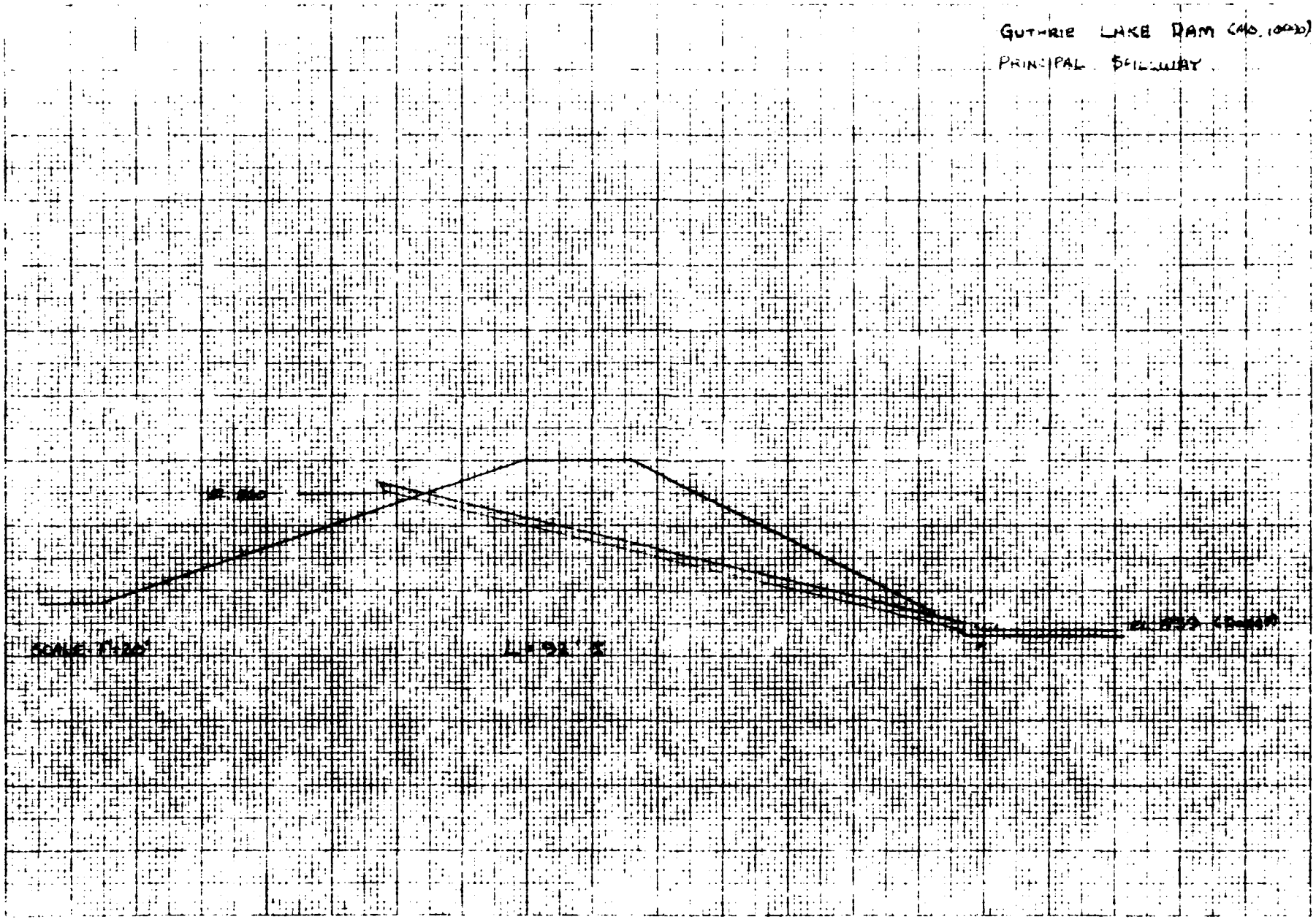
DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. 2 OF 4

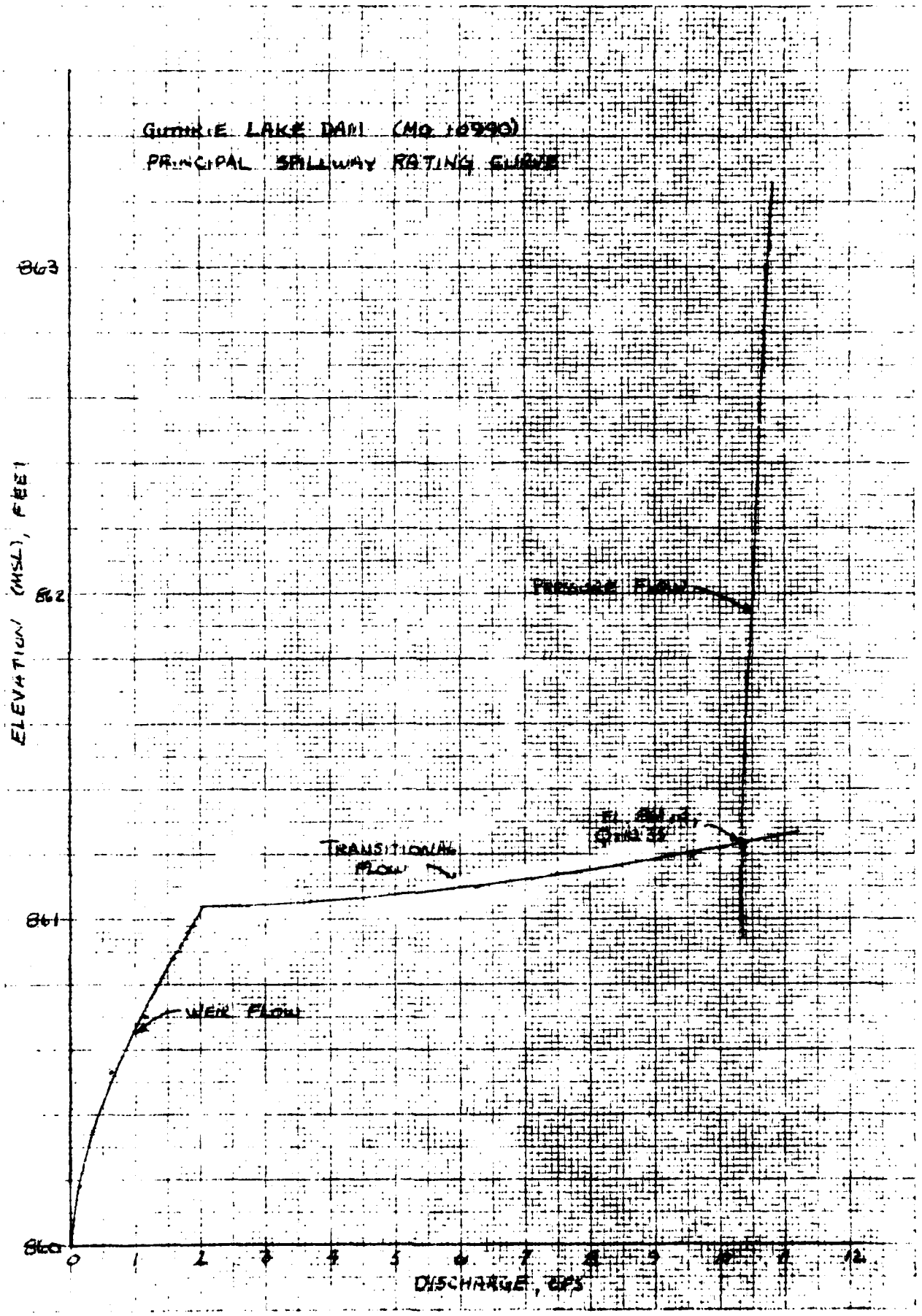
GUTHRIE LAKE DAM (MO 10990) JOB NO. 1263

PRINCIPAL SPILLWAY RATING CURVE DEVELOPMENT BY JFK DATE 7/8/80
RLS

H = W.S. EL. − 839.44

W.S. ELEV.	H	Q
861.0	21.56	10.28
861.2	21.76	10.37
861.4	21.96	10.36
862.8	23.36	10.68
863.0	23.56	10.73
865.0	25.56	11.17
867.0	27.56	11.60


GUTHRIE LAKE DAM (MO. 00020)
PRINCIPAL SPILLWAY


GUNNISON LAKE DAM (MO 10990)
PRINCIPAL SPILLWAY RATING CURVE
ELEVATION (MSL), FEET
863
862
861
860
PRESSURE FLOW
TRANSITIONAL FLOW
WEIR FLOW
0
1
2
3
4
5
6
7
8
9
10
11
12
DISCHARGE, CFS

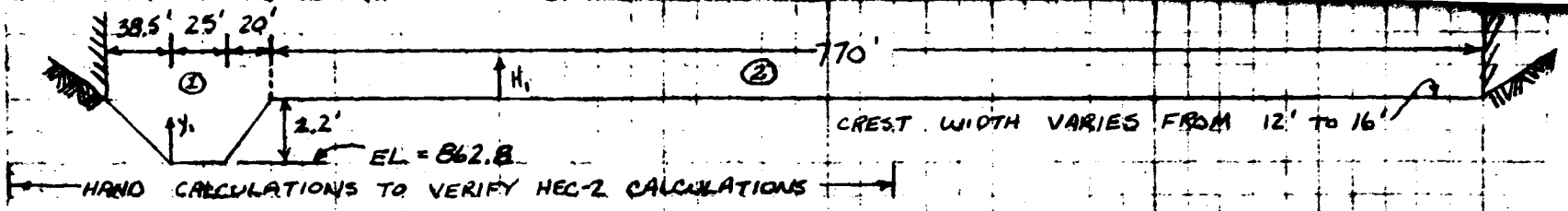
PRC ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. 1 OF 2

GUTHRIE LAKE DAM (MO 10990) JOB NO. 1263

EMERGENCY SPILLWAY AND OVERTOP RATING CURVE BY VFK DATE 11/1/80

ECI-4



HAND CALCULATIONS TO VERIFY HEC-2 CALCULATIONS

y	T	A	$V_2\frac{\alpha_2}{2g}$	Q=VA	y_1	$S_f \times 10^{-3}$	A_1	P_1	$\frac{Y_1^{1.99}}{R^{1.33}S_f^{.5}}$	$V_1^2/2g$	W.S. EL $y_1 + V_1^2/2g$ 862.8	H_1	C_1	L	$Q_1 = C_1 L H_1^{1.5}$	$Q_{TOTAL} = Q + Q_1$
0	0	0	0	0	0	0	0	0	0	0	862.8					0
0.16	29.38	4.48	2.23	10	0.34	17.27	9.93	33.96	1.01	0.02	863.2					10
0.46	37.13	14.17	3.53	50	0.73	26.78	25.50	44.61	1.96	0.06	863.6					50
0.70	43.48	23.80	4.20	100	1.03	31.00	39.39	52.15	2.54	0.10	863.9					100
1.04	52.56	40.19	4.98	200	1.43	33.93	62.98	63.04	3.18	0.16	864.4					200
1.30	59.46	54.73	5.48	300	1.73	34.53	83.50	71.18	3.59	0.20	864.7					300
1.51	65.26	68.33	5.85	400	1.98	34.04	101.41	77.58	3.94	0.24	865.0					400
1.71	70.35	81.31	6.15	500	2.19	36.78	118.52	83.24	4.22	0.28	865.3	0.3	2.99	770	378.3	878.3
1.88	75.03	94.10	6.38	600	2.37	35.99	133.47	83.68	4.50	0.31	865.5	0.5	3.02	770	822.2	1322.2
2.17	82.78	117.11	6.83	800	2.68	36.03	159.03	83.68	5.03	0.39	865.9	0.9	3.03	770	1992.0	2792
2.40	83.50	136.27	7.34	1000	2.94	37.05	180.73	83.68	5.53	0.48	866.2	1.2	3.04	770	3077.1	4077.1
2.61	83.50	153.94	7.80	1200	3.18	37.91	200.70	83.68	5.98	0.56	866.5	1.5	3.04	770	4300.3	5500.3
2.82	83.50	170.71	8.20	1400	3.41	37.86	220.72	83.68	6.34	0.62	866.8	1.8	3.04	770	5652.9	7052.9
3.01	83.50	186.68	8.57	1600	3.63	38.27	238.83	83.68	6.70	0.70	867.1	2.1	3.05	770	7146.9	8746.9
3.19	83.50	202.23	8.90	1800	3.84	38.66	256.03	83.68	7.03	0.77	867.4	2.4	3.06	770	8760.5	10560.5

SECTION 1 :

at the critical depth section;

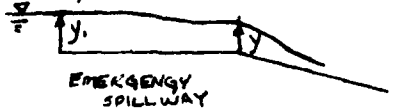
$0 < y < 2.2$, $T = 26.59y + 25$

$A = y(T - 13.3y)$

$2.2 \leq y$, $T = 83.5$

$A = 83.5y - 64.35$

at the upstream section, at the dam, y_1 was determined from a backwater analysis using HEC-2



SECTION 2:

H_1 = W.S. EL. − 685

$Q_1 = C_1 L H_1^{1.5}$

ECI-4 **PRC ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION / MISSOURI - 1980 — SHEET NO. 2 OF 2

GUTHRIE LAKE DAM (MO 10990) — JOB NO. 1263

EMERGENCY SPILLWAY SLOPE — BY JFK — DATE 7/9/80

CHECK EMERGENCY SPILLWAY SLOPE FOR CRITICAL DEPTH,

$S_b = 1.9'/50' = 0.038$

for $y = 0.46'$,

$A = 14.17\ ft^2$
$P = 37.13$
$n = 0.027$
$Q = 50$

$$S_c = \left[\frac{n}{1.49} Q \frac{1}{R^{2/3}} \frac{1}{A}\right]^2$$

$$S_c = \left[\frac{0.027}{1.49} (50) \frac{1}{(0.382)^{2/3}} \frac{1}{14.17}\right]^2 = 0.0148 < S_b \quad O.K.$$

for $y = 3.01'$,

$A = 186.87\ ft^2$
$P = 83.68\ ft$
$n = 0.027$
$Q = 1600$

$$S_c = \left[\frac{n}{1.49} Q \frac{1}{R^{2/3}} \frac{1}{A}\right]^2$$

$$S_c = \left[\frac{0.027}{1.49} (1600) \frac{1}{(2.233)^{2/3}} \frac{1}{186.87}\right]^2 = 0.008 < S_b \quad O.K.$$

∴ the assumption of critical depth at the emergency spillway is valid.

EC1-4 **PRC ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. 1 OF 1

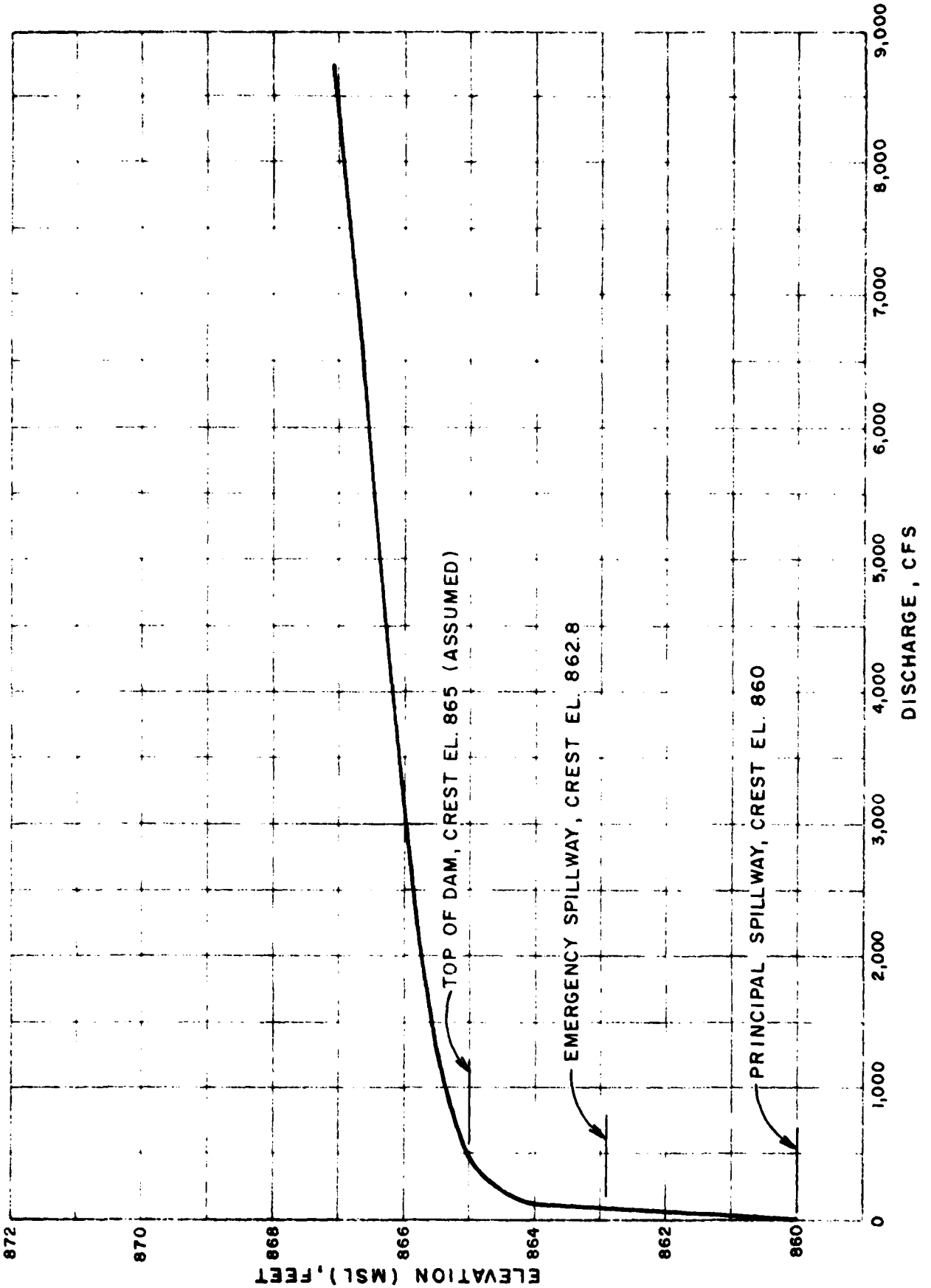
GUTHRIE LAKE DAM (MO. 10990) JOB NO. 1263

COMBINED RATING CURVE BY JFK DATE 7/9/80

W.S. ELEV.	Q PRINCIPAL SPILLWAY	Q EMRGNCY SPWY AND OVERTOP	Q TOTAL
860	0		0
860.5	0.6*		0.6
861	2.0*		2.0
861.5	10.4		10.4
862	10.5		10.5
862.8	10.7	0	10.7
863.2	10.8	10	20.8
863.6	10.9	50	61
863.9	10.9	100	111
864.4	11.0	200	211
864.7	11.1	300	311
865	11.2	400	411
865.3	11.2	878.3	890
865.5	11.3	1322.2	1334
865.9	11.4	2792	2803
866.2	11.4	4077.1	4089
866.5	11.5	5500.3	5512
866.8	11.6	7052.9	7065
867.1	11.6	8746.9	8759
867.4	11.7	10560.5	10572

NOTE:
* weir flow equation for elevations 861.5 and above, pressure flow controls, where H = W.S. ELEV - 839.44
$Q = 2.21\sqrt{H}$

PLATE 3, APPENDIX B



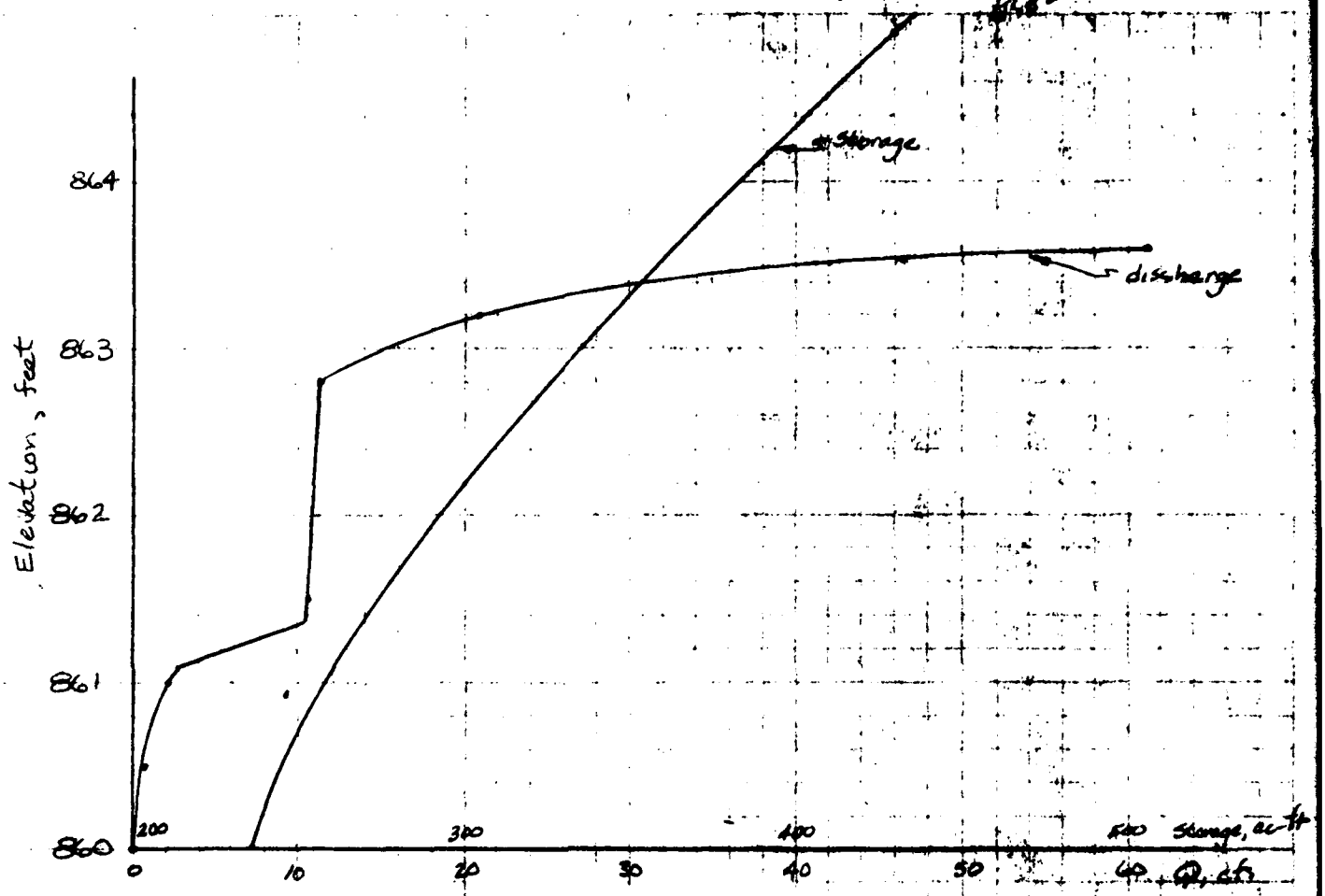
GUTHRIE LAKE DAM (MO. 10990)
SPILLWAY AND OVERTOP RATING CURVE

ECI-4 **PRC ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. 1 OF 2

GUTHRIE LAKE DAM (MO 10990) JOB NO. 1263

STARTING ELEVATION FOR PMF ROUTING BY JFK DATE 7/18/80



W.S. ELEV$_i$	W.S. ELEV$_f$	Δ STORAGE	$Q_{AVERAGE}$	Δ TIME (HRS)	Σ TIME
863.7*	863.2	22	50	5.33	5.33
863.2	862.8	19	20	11.50	16.83
862.8	861.6	48	10.5	55.31	72.14

* W.S. ELEV. at end of 24 hrs after the 1/2 PMF storm began.

∴ at the end of the four day period the W.S. level is at 861.6

ECI-4 **PRC ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION / MISSOURI - 1980 SHEET NO. 2 OF 2

GUTHRIE LAKE DAM (MO. 10990) JOB NO. 1263

STARTING ELEVATION FOR 1/2 PMF BY JFK DATE 7/18/80

W.S. ELEV$_i$	W.S. ELEV$_f$	Δ STORAGE	Q AVERAGE	Δ TIME (HRS)	Σ TIME
863.5 *	863.2	12	36	4.03	4.03
863.2	862.8	19	20	11.50	[illegible]
862.8	861.6	49	10.5	56.47	72.0 (days)

* W.S. ELEV. at the end of 24 hrs. after the 1/4 PMF storm began.

∴ at the end of the four day period the W.S. level is at 861.6

HEC1DB INPUT DATA

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
```

```
    1                A1                          DAM SAFETY INSPECTION - MISSOURI
    2                A2                            GUTHRIE LAKE DAM (MO.10990)
    3                A3                            PMF AND 50 PERCENT PMF
    4                R     300        0        5        0        0        0        0        0        0        0
    5                B1      5
    6                J       1        2        1
    7                J1      1       .5
    8                K       0    10990                                            1
    9                K1   INPUT RUNOFF PARAMETERS
   10                M       1        2     .476                .476        1                                 1
   11                P              24.8      100      120      130
   12                T                                                                -1      -94
   13                J2              .23
   14                X                        1
   15                K       1    10990                                            1
   16                K1   ROUTE HYDROGRAPH THROUGH GUTHRIE LAKE
   17                Y                                 1        1
   18                Y1      1                                                   -861.6      -1
   19                Y4    860      860.5      861      861.5      862      862.8    863.2    863.6    863.9    864.4
   20                Y4  864.7        865    865.3      865.5    865.9      866.2    866.5    866.8    867.1    867.4
   21                Y5      0         .6        2       10.4     10.5       10.7     20.8       61      111      211
   22                Y5    311        411      890       1334     2803       4089     5512     7065     8759    10572
   23                EA      0       10.5       30       41.5       50         74      141
   24                EE    838        850      860      862.8      865        870      880
   25                EI    560
   26                ED    865
   27                K      99
```

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATION

RUNOFF HYDROGRAPH AT 10090
ROUTE HYDROGRAPH TO 10990
END OF NETWORK

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 02/07/10.
TIME= 13.58.04.

DAM SAFETY INSPECTION - FISCHBURG
SUTHRIE LAKE DAM (MD.10015)
PMF AND [illegible] PERCENT PMF

JOB SPECIFICATION

IO	NHR	NPLT	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
220	2	1	2	0	2	0	1	0	2

JOPER	NMT	LROPT	TRACE
2		1	0

MULTI-PLAN ANALYSIS TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIOS= 1.00 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT RUNOFF PARAMETERS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10950	0	0	0	0	1	1	2	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.49	0.00	.49	1.00	0.00		1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.00	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-94.00	0.00	0.00

CURVE NO = -94.00 WETNESS = -1.20 EFFECT CN = 94.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .23

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 16 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .23 VOL= 1.00

168.	576.	839.	771.	541.	309.	171.	115.	70.	42.
26.	16.	10.	6.	3.	1.				

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.55	151	.21	.21	.00	716.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.60	152	.21	.21	.00	732.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.65	153	.21	.21	.00	742.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.21	.21	.00	748.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.55	155	.21	.21	.00	752.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.21	.21	.00	754.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.25	.25	.00	762.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.25	.25	.00	787.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.25	.25	.00	822.
1.01	.50	10	.01	.00	.01	0.	1.01	13.20	160	.25	.25	.00	854.
1.01	.55	11	.01	.00	.01	0.	1.01	13.25	161	.25	.25	.00	877.
1.01	1.00	12	.01	.00	.01	1.	1.01	13.30	162	.25	.25	.00	890.
1.01	1.05	13	.01	.00	.01	2.	1.01	13.35	163	.25	.25	.00	898.
1.01	1.10	14	.01	.00	.01	3.	1.01	13.40	164	.25	.25	.00	903.
1.01	1.15	15	.01	.00	.01	5.	1.01	13.45	165	.25	.25	.00	906.
1.01	1.20	16	.01	.00	.01	6.	1.01	13.50	166	.25	.25	.00	908.
1.01	1.25	17	.01	.00	.01	8.	1.01	13.55	167	.25	.25	.00	909.
1.01	1.30	18	.01	.00	.01	9.	1.01	14.00	168	.25	.25	.00	910.
1.01	1.35	19	.01	.00	.01	11.	1.01	14.05	169	.31	.31	.00	921.
1.01	1.40	20	.01	.00	.01	12.	1.01	14.10	170	.31	.31	.00	957.
1.01	1.45	21	.01	.00	.01	14.	1.01	14.15	171	.31	.31	.00	1009.
1.01	1.50	22	.01	.01	.01	15.	1.01	14.20	172	.31	.31	.00	1057.
1.01	1.55	23	.01	.01	.01	16.	1.01	14.25	173	.31	.31	.00	1090.
1.01	2.00	24	.01	.01	.01	17.	1.01	14.30	174	.31	.31	.00	1109.
1.01	2.05	25	.01	.01	.01	19.	1.01	14.35	175	.31	.31	.00	1121.
1.01	2.10	26	.01	.01	.01	20.	1.01	14.40	176	.31	.31	.00	1128.
1.01	2.15	27	.01	.01	.01	21.	1.01	14.45	177	.31	.31	.00	1133.
1.01	2.20	28	.01	.01	.01	22.	1.01	14.50	178	.31	.31	.00	1136.
1.01	2.25	29	.01	.01	.01	23.	1.01	14.55	179	.31	.31	.00	1138.
1.01	2.30	30	.01	.01	.01	24.	1.01	15.00	180	.31	.31	.00	1139.
1.01	2.35	31	.01	.01	.01	24.	1.01	15.05	181	.19	.19	.00	1119.
1.01	2.40	32	.01	.01	.01	25.	1.01	15.10	182	.38	.38	.00	1061.
1.01	2.45	33	.01	.01	.01	26.	1.01	15.15	183	.38	.38	.00	1008.
1.01	2.50	34	.01	.01	.01	27.	1.01	15.20	184	.57	.56	.00	1184.
1.01	2.55	35	.01	.01	.01	27.	1.01	15.25	185	.66	.66	.00	1358.
1.01	3.00	36	.01	.01	.01	28.	1.01	15.30	186	1.60	1.60	.00	1422.
1.01	3.05	37	.01	.01	.01	28.	1.01	15.35	187	2.64	2.64	.00	2797.
1.01	3.10	38	.01	.01	.01	29.	1.01	15.40	188	1.04	1.04	.00	4113.
1.01	3.15	39	.01	.01	.01	30.	1.01	15.45	189	.66	.66	.00	4944.
1.01	3.20	40	.01	.01	.01	30.	1.01	15.50	190	.57	.57	.00	4649.
1.01	3.25	41	.01	.01	.00	31.	1.01	15.55	191	.38	.38	.00	3918.
1.01	3.30	42	.01	.01	.00	32.	1.01	16.00	192	.38	.38	.00	3094.
1.01	3.35	43	.01	.01	.00	32.	1.01	16.05	193	.29	.29	.00	2474.
1.01	3.40	44	.01	.01	.00	33.	1.01	16.10	194	.29	.29	.00	1999.
1.01	3.45	45	.01	.01	.00	33.	1.01	16.15	195	.29	.29	.00	1657.
1.01	3.50	46	.01	.01	.00	33.	1.01	16.20	196	.29	.29	.00	1404.
1.01	3.55	47	.01	.01	.00	34.	1.01	16.25	197	.29	.29	.00	1288.
1.01	4.00	48	.01	.01	.00	34.	1.01	16.30	198	.29	.29	.00	1199.
1.01	4.05	49	.01	.01	.00	35.	1.01	16.35	199	.29	.29	.00	1147.
1.01	4.10	50	.01	.01	.00	35.	1.01	16.40	200	.29	.29	.00	1115.
1.01	4.15	51	.01	.01	.00	35.	1.01	16.45	201	.29	.29	.00	1093.
1.01	4.20	52	.01	.01	.00	36.	1.01	16.50	202	.29	.29	.00	1078.
1.01	4.25	53	.01	.01	.00	36.	1.01	16.55	203	.29	.29	.00	1071.
1.01	4.30	54	.01	.01	.00	36.	1.01	17.00	204	.29	.29	.00	1068.
1.01	4.35	55	.01	.01	.00	37.	1.01	17.05	205	.23	.23	.00	1056.
1.01	4.40	56	.01	.01	.00	37.	1.01	17.10	206	.23	.23	.00	1020.

1.01	4.45	57	.01	.01	.00	37.	1.01	17.15	207	.23	.23	.00	957.
1.01	4.50	58	.01	.01	.00	38.	1.01	17.20	208	.23	.23	.00	920.
1.01	4.55	59	.01	.01	.00	38.	1.01	17.25	209	.23	.23	.00	886.
1.01	5.00	60	.01	.01	.00	38.	1.01	17.30	210	.23	.23	.00	857.
1.01	5.05	61	.01	.01	.00	38.	1.01	17.35	211	.23	.23	.00	855.
1.01	5.10	62	.01	.01	.00	39.	1.01	17.40	212	.23	.23	.00	848.
1.01	5.15	63	.01	.01	.00	39.	1.01	17.45	213	.23	.23	.00	844.
1.01	5.20	64	.01	.01	.00	39.	1.01	17.50	214	.23	.23	.00	841.
1.01	5.25	65	.01	.01	.00	39.	1.01	17.55	215	.23	.23	.00	839.
1.01	5.30	66	.01	.01	.00	40.	1.01	18.00	216	.23	.23	.00	838.
1.01	5.35	67	.01	.01	.00	40.	1.01	18.05	217	.02	.02	.00	803.
1.01	5.40	68	.01	.01	.00	40.	1.01	18.10	218	.02	.02	.00	684.
1.01	5.45	69	.01	.01	.00	41.	1.01	18.15	219	.02	.02	.00	610.
1.01	5.50	70	.01	.01	.00	41.	1.01	18.20	220	.02	.02	.00	551.
1.01	5.55	71	.01	.01	.00	41.	1.01	18.25	221	.02	.02	.00	239.
1.01	6.00	72	.01	.01	.00	41.	1.01	18.30	222	.02	.02	.00	175.
1.01	6.05	73	.07	.06	.01	49.	1.01	18.35	223	.02	.02	.00	136.
1.01	6.10	74	.07	.06	.01	75.	1.01	18.40	224	.02	.02	.00	112.
1.01	6.15	75	.07	.06	.01	115.	1.01	18.45	225	.02	.02	.00	98.
1.01	6.20	76	.07	.06	.01	151.	1.01	18.50	226	.02	.02	.00	89.
1.01	6.25	77	.07	.06	.01	178.	1.01	18.55	227	.02	.02	.00	83.
1.01	6.30	78	.07	.06	.01	199.	1.01	19.00	228	.02	.02	.00	80.
1.01	6.35	79	.07	.06	.01	209.	1.01	19.05	229	.02	.02	.00	78.
1.01	6.40	80	.07	.06	.01	214.	1.01	19.10	230	.02	.02	.00	77.
1.01	6.45	81	.07	.06	.01	219.	1.01	19.15	231	.02	.02	.00	76.
1.01	6.50	82	.07	.06	.01	225.	1.01	19.20	232	.02	.02	.00	76.
1.01	6.55	83	.07	.06	.01	229.	1.01	19.25	233	.02	.02	.00	76.
1.01	7.00	84	.07	.06	.01	231.	1.01	19.30	234	.02	.02	.00	76.
1.01	7.05	85	.07	.06	.01	232.	1.01	19.35	235	.02	.02	.00	76.
1.01	7.10	86	.07	.06	.00	232.	1.01	19.40	236	.02	.02	.00	76.
1.01	7.15	87	.07	.06	.00	234.	1.01	19.45	237	.02	.02	.00	76.
1.01	7.20	88	.07	.06	.00	235.	1.01	19.50	238	.02	.02	.00	76.
1.01	7.25	89	.07	.06	.00	236.	1.01	19.55	239	.02	.02	.00	76.
1.01	7.30	90	.07	.07	.00	237.	1.01	20.00	240	.02	.02	.00	76.
1.01	7.35	91	.07	.07	.00	238.	1.01	20.05	241	.02	.02	.00	76.
1.01	7.40	92	.07	.07	.00	239.	1.01	20.10	242	.02	.02	.00	76.
1.01	7.45	93	.07	.07	.00	239.	1.01	20.15	243	.02	.02	.00	76.
1.01	7.50	94	.07	.07	.00	240.	1.01	20.20	244	.02	.02	.00	76.
1.01	7.55	95	.07	.07	.00	241.	1.01	20.25	245	.02	.02	.00	76.
1.01	8.00	96	.07	.07	.00	241.	1.01	20.30	246	.02	.02	.00	76.
1.01	8.05	97	.07	.07	.00	242.	1.01	20.35	247	.02	.02	.00	76.
1.01	8.10	98	.07	.07	.00	243.	1.01	20.40	248	.02	.02	.00	76.
1.01	8.15	99	.07	.07	.00	243.	1.01	20.45	249	.02	.02	.00	76.
1.01	8.20	100	.07	.07	.00	243.	1.01	20.50	250	.02	.02	.00	76.
1.01	8.25	101	.07	.07	.00	244.	1.01	20.55	251	.02	.02	.00	76.
1.01	8.30	102	.07	.07	.00	244.	1.01	21.00	252	.02	.02	.00	76.
1.01	8.35	103	.07	.07	.00	245.	1.01	21.05	253	.02	.02	.00	76.
1.01	8.40	104	.07	.07	.00	245.	1.01	21.10	254	.02	.02	.00	76.
1.01	8.45	105	.07	.07	.00	245.	1.01	21.15	255	.02	.02	.00	76.
1.01	8.50	106	.07	.07	.00	246.	1.01	21.20	256	.02	.02	.00	76.
1.01	8.55	107	.07	.07	.00	246.	1.01	21.25	257	.02	.02	.00	76.
1.01	9.00	108	.07	.07	.00	246.	1.01	21.30	258	.02	.02	.00	76.
1.01	9.05	109	.07	.07	.00	247.	1.01	21.35	259	.02	.02	.00	76.
1.01	9.10	110	.07	.07	.00	247.	1.01	21.40	260	.02	.02	.00	76.
1.01	9.15	111	.07	.07	.00	247.	1.01	21.45	261	.02	.02	.00	76.
1.01	9.20	112	.07	.07	.00	247.	1.01	21.50	262	.02	.02	.00	76.
1.01	9.25	113	.07	.07	.00	248.	1.01	21.55	263	.02	.02	.00	76.
1.01	9.30	114	.07	.07	.00	248.	1.01	22.00	264	.02	.02	.00	76.
1.01	9.35	115	.07	.07	.00	248.	1.01	22.05	265	.02	.02	.00	76.
1.01	9.40	116	.07	.07	.00	248.	1.01	22.10	266	.02	.02	.00	76.

1.01	9.45	117	.07	.01	.00	248.	1.01	22.15	267	.02	.02	.00	76.
1.01	9.50	118	.07	.07	.00	248.	1.01	22.20	268	.02	.02	.00	76.
1.01	9.55	119	.07	.07	.00	249.	1.01	22.25	269	.02	.02	.00	76.
1.01	10.00	120	.07	.07	.00	249.	1.01	22.30	270	.02	.02	.00	76.
1.01	10.05	121	.07	.07	.00	249.	1.01	22.35	271	.02	.02	.00	76.
1.01	10.10	122	.07	.07	.00	249.	1.01	22.40	272	.02	.02	.00	76.
1.01	10.15	123	.07	.07	.00	249.	1.01	22.45	273	.02	.02	.00	76.
1.01	10.20	124	.07	.07	.00	249.	1.01	22.50	274	.02	.02	.00	76.
1.01	10.25	125	.07	.07	.00	249.	1.01	22.55	275	.02	.02	.00	76.
1.01	10.30	126	.07	.07	.00	250.	1.01	23.00	276	.02	.02	.00	76.
1.01	10.35	127	.07	.07	.00	250.	1.01	23.05	277	.02	.02	.00	76.
1.01	10.40	128	.07	.07	.00	250.	1.01	23.10	278	.02	.02	.00	76.
1.01	10.45	129	.07	.07	.00	250.	1.01	23.15	279	.02	.02	.00	76.
1.01	10.50	130	.07	.07	.00	250.	1.01	23.20	280	.02	.02	.00	76.
1.01	10.55	131	.07	.07	.00	250.	1.01	23.25	281	.02	.02	.00	76.
1.01	11.00	132	.07	.07	.00	250.	1.01	23.30	282	.02	.02	.00	76.
1.01	11.05	133	.07	.07	.00	250.	1.01	23.35	283	.02	.02	.00	76.
1.01	11.10	134	.07	.07	.00	250.	1.01	23.40	284	.02	.02	.00	76.
1.01	11.15	135	.07	.07	.00	250.	1.01	23.45	285	.02	.02	.00	76.
1.01	11.20	136	.07	.07	.00	251.	1.01	23.50	286	.02	.02	.00	76.
1.01	11.25	137	.07	.07	.00	251.	1.01	23.55	287	.02	.02	.00	76.
1.01	11.30	138	.07	.07	.00	251.	1.01	0.00	288	.02	.02	.00	76.
1.01	11.35	139	.07	.07	.00	251.	1.01	.05	289	1.00	0.00	0.00	73.
1.01	11.40	140	.07	.07	.00	251.	1.01	.10	290	1.00	0.00	0.00	61.
1.01	11.45	141	.07	.07	.00	251.	1.01	.15	291	0.00	0.00	0.00	43.
1.01	11.50	142	.07	.07	.00	251.	1.01	.20	292	0.00	0.00	0.00	27.
1.01	11.55	143	.07	.07	.00	251.	1.01	.25	293	0.00	0.00	0.00	16.
1.01	12.00	144	.07	.07	.00	251.	1.01	.30	294	0.00	0.00	0.00	10.
1.01	12.05	145	.21	.20	.00	274.	1.01	.35	295	0.00	0.00	0.00	6.
1.01	12.10	146	.21	.20	.00	353.	1.01	.40	296	0.00	0.00	0.00	4.
1.01	12.15	147	.21	.20	.00	467.	1.01	.45	297	0.00	0.00	0.00	2.
1.01	12.20	148	.21	.21	.00	576.	1.01	.50	298	0.00	0.00	0.00	1.
1.01	12.25	149	.21	.21	.00	647.	1.01	.55	299	0.00	0.00	0.00	1.
1.01	12.30	150	.21	.21	.00	689.	1.01	1.00	300	0.00	0.00	.00	0.

SUM	32.24	31.49	.72	113996.	
	(819.)	(800.)	(18.)	(3280.68)	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4544.	1250.	444.	387.	116003.
CMS	137.	35.	11.	11.	3285.
INCHES		24.48	31.49	31.49	31.49
MM		621.72	799.75	799.75	799.75
AC-FT		1231.	799.	799.	799.
THOUS CU M		766.	986.	986.	985.

HYDROGRAPH AT STA 10990 FOR PLAN 1, RTIO 1

0.	0.	1.	1.	0.	0.	0.	0.	0.	0.
0.	1.	2.	3.	5.	6.	7.	9.	11.	12.
14.	15.	16.	17.	19.	20.	21.	22.	23.	24.
24.	25.	26.	27.	27.	28.	29.	29.	30.	30.
31.	32.	32.	33.	33.	33.	34.	34.	35.	35.
35.	36.	36.	36.	37.	37.	37.	38.	38.	39.
38.	39.	39.	39.	39.	40.	40.	40.	40.	41.
41.	41.	49.	75.	115.	151.	178.	195.	206.	214.
219.	223.	226.	228.	230.	232.	234.	235.	236.	237.
239.	239.	239.	240.	241.	241.	242.	243.	243.	243.
244.	244.	245.	245.	245.	246.	246.	246.	247.	47.

247.	247.	248.	248.	248.	248.	248.	248.	249.	249.
249.	249.	249.	249.	249.	250.	250.	250.	250.	250.
250.	250.	250.	250.	250.	251.	251.	251.	251.	251.
251.	251.	251.	251.	274.	353.	467.	573.	647.	689.
716.	732.	742.	748.	752.	754.	762.	767.	822.	854.
877.	898.	898.	903.	906.	908.	909.	910.	921.	937.
1089.	1097.	1090.	1109.	1121.	1129.	1133.	1136.	1138.	1139.
1119.	1061.	1088.	1184.	1369.	1822.	2797.	4113.	4844.	4649.
3910.	3094.	2474.	1999.	1647.	1430.	1285.	1199.	1147.	1115.
1093.	1078.	1071.	1068.	1066.	1020.	967.	920.	886.	867.
8[illegible].	848.	844.	841.	839.	838.	833.	694.	510.	351.
219.	175.	136.	112.	98.	89.	83.	80.	78.	77.
76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	76.	76.	73.	61.
43.	27.	16.	10.	6.	4.	3.	1.	1.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4844.	1252.	435.	307.	110003.
CMS	137.	35.	11.	11.	3245.
INCHES		24.49	31.49	31.49	31.49
MM		621.72	799.75	799.75	799.7
AC-FT		621.	799.	799.	799.
THOUS CU M		766.	985.	985.	985.

HYDROGRAPH AT STA 10990 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	2.	2.	3.	4.	5.	5.	6.
7.	8.	8.	9.	9.	10.	10.	11.	11.	12.
12.	13.	13.	13.	14.	14.	14.	15.	15.	15.
15.	16.	16.	16.	16.	17.	17.	17.	17.	18.
18.	18.	18.	18.	18.	19.	19.	19.	19.	19.
19.	19.	20.	20.	20.	20.	20.	20.	20.	20.
20.	20.	24.	38.	57.	76.	89.	97.	103.	107.
109.	111.	113.	114.	115.	116.	117.	117.	118.	118.
119.	119.	120.	120.	120.	121.	121.	121.	122.	122.
122.	122.	122.	123.	123.	123.	123.	123.	123.	123.
124.	124.	124.	124.	124.	124.	124.	124.	124.	124.
124.	125.	125.	125.	125.	125.	125.	125.	125.	125.
125.	125.	125.	125.	125.	125.	125.	125.	125.	125.
125.	125.	128.	126.	137.	176.	234.	286.	323.	345.
358.	366.	371.	374.	376.	377.	381.	394.	411.	427.
438.	445.	449.	451.	453.	454.	454.	455.	460.	478.
504.	528.	545.	555.	561.	564.	567.	568.	569.	569.
559.	541.	544.	592.	694.	911.	1399.	2056.	2422.	2325.
1935.	1547.	1237.	1008.	829.	715.	643.	608.	574.	557.
548.	539.	536.	534.	526.	518.	484.	460.	443.	433.
428.	424.	422.	420.	420.	419.	402.	342.	255.	175.
120.	88.	68.	56.	49.	44.	42.	40.	39.	38.
38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	38.	38.	36.	30.

PMF AND ONE-HALF PMF ROUTING

22.	11.	8.	6.	5.	4.	1.	1.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2402.	420.	201.	195.	58802.
CMS	68.	12.	6.	5.	1662.
INCHES		1.34	15.74	15.74	15.74
HM		312.86	369.87	369.86	369.87
AC-FT		311.	399.	399.	399.
THOUS CU M		383.	493.	493.	493.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH GUTHRIE LAKE

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10990	1	0	0		0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		1

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	-1

STAGE	859.00	860.50	861.50	862.50	863.00	863.20	863.60	863.80	864.40
	864.70	865.00	865.30	865.50	865.80	865.90	866.50	866.80	867.10
FLOW	0.0	.00	2.00	10.40	10.50	10.70	20.00	61.00	111.00
	211.00	411.00	900.00	1574.00	2613.00	4089.00	5512.00	7065.00	8759.00
SURFACE AREA=	0.	11.	30.	42.	50.	74.	141.		
CAPACITY=	0.	42.	236.	336.	436.	744.	1902.		
ELEVATION=	858.	859.	860.	861.	865.	870.	880.		

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
869.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
865.0	0.0	0.0	0.

STATION 10990, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.

10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	11.	12.	13.	14.	15.	16.	17.	18.	[illegible]
20.	21.	23.	27.	30.	34.	37.	41.	44.	47.
[illegible]	53.	56.	59.	[illegible]	[illegible]	72.	77.	81.	85.
91.	94.	97.	101.	105.	109.	112.	116.	120.	124.
126.	132.	135.	139.	142.	147.	155.	165.	176.	192.
207.	228.	252.	275.	[illegible]	316.	[illegible]	[illegible]	375.	399.
[illegible]	536.	606.	663.	709.	747.	779.	[illegible]	824.	[illegible]
[illegible]	907.	[illegible]	988.	1021.	1047.	1068.	[illegible]	1098.	1108.
1114.	1110.	1104.	1112.	[illegible]	1271.	1645.	2541.	3700.	3857.
4034.	3611.	[illegible]	2889.	[illegible]	2118.	1925.	[illegible]	[illegible]	1323.
[illegible]	1222.	[illegible]	1156.	[illegible]	[illegible]	1079.	1645.	1305.	775.
946.	722.	[illegible]	868.	875.	[illegible]	942.	[illegible]	793.	722.
639.	554.	475.	410.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	732.
327.	339.	[illegible]	280.	279.	270.	261.	252.	244.	236.
229.	222.	[illegible]	209.	[illegible]	[illegible]	198.	195.	192.	188.
185.	182.	179.	176.	[illegible]	170.	167.	[illegible]	162.	160.
[illegible]	155.	153.	150.	[illegible]	146.	144.	142.	140.	138.
137.	135.	132.	[illegible]	[illegible]	128.	[illegible]	125.	124.	122.
121.	120.	118.	117.	116.	115.	[illegible]	112.	111.	110.
109.	107.	[illegible]	102.	100.	98.	[illegible]	93.	91.	89.

STORAGE

285.	[illegible]	287.	289.	[illegible]	[illegible]	[illegible]	288.	[illegible]	[illegible]
[illegible]	[illegible]	288.	289.	[illegible]	[illegible]	[illegible]	284.	[illegible]	280.
[illegible]	288.	[illegible]	288.	[illegible]	286.	[illegible]	[illegible]	289.	283.
[illegible]	289.	[illegible]	289.	[illegible]	[illegible]	[illegible]	290.	[illegible]	290.
[illegible]	293.	292.	[illegible]	291.	[illegible]	291.	[illegible]	291.	291.
291.	292.	292.	292.	292.	292.	[illegible]	[illegible]	293.	293.
293.	294.	294.	294.	294.	294.	294.	295.	[illegible]	[illegible]
295.	296.	296.	296.	297.	298.	299.	302.	301.	302.
304.	305.	307.	308.	310.	311.	313.	314.	316.	317.
319.	321.	322.	324.	325.	327.	328.	330.	332.	333.
335.	336.	339.	340.	341.	343.	344.	346.	348.	349.
351.	352.	354.	355.	357.	358.	362.	361.	363.	364.
[illegible]	367.	368.	369.	371.	372.	373.	374.	376.	377.
375.	379.	380.	361.	[illegible]	383.	384.	385.	386.	387.
388.	388.	389.	[illegible]	391.	392.	[illegible]	394.	399.	403.
406.	410.	413.	416.	410.	423.	426.	428.	431.	435.
436.	440.	442.	444.	446.	447.	[illegible]	443.	445.	450.
451.	452.	453.	454.	455.	455.	456.	456.	456.	457.
457.	457.	456.	457.	458.	460.	460.	476.	493.	497.
499.	496.	490.	484.	478.	473.	469.	466.	463.	452.
460.	459.	456.	458.	457.	457.	[illegible]	455.	[illegible]	453.
453.	452.	452.	451.	451.	451.	451.	[illegible]	449.	446.
444.	441.	438.	436.	434.	432.	430.	423.	426.	425.
428.	421.	420.	418.	417.	415.	414.	413.	412.	411.
410.	409.	408.	407.	406.	405.	404.	403.	402.	402.
401.	[illegible]	399.	399.	398.	397.	397.	396.	396.	393.
394.	394.	393.	393.	392.	392.	391.	391.	390.	390.
390.	389.	389.	388.	388.	368.	387.	387.	387.	386.
386.	386.	385.	385.	385.	385.	384.	384.	384.	384.
[illegible]	383.	382.	381.	381.	380.	379.	379.	378.	378.

STAGE

861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6

AD-A106 626 PRC CONSOER TOWNSEND INC ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. GUTHRIE LAKE DAM (MO 10990), MISSO--ETC(U)
SEP 80 W G SHIFRIN DACW43-80-C-0094
UNCLASSIFIED NL

END
DATE FILMED
11-81
DTIC

861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.7	861.7	861.7
861.7	861.7	861.7	861.7	861.7	861.7	861.7	861.7	861.7	861.7
861.7	861.7	861.7	861.7	861.7	861.7	861.7	861.8	861.[illegible]	861.8
861.8	861.8	861.8	861.8	861.8	861.8	861.9	861.9	861.[illegible]	862.[illegible]
862.0	862.0	862.1	862.1	862.2	862.2	862.2	862.3	862.3	862.3
862.4	862.4	862.5	862.5	862.5	862.6	862.6	862.7	862.7	862.7
862.[illegible]	862.[illegible]	862.9	862.[illegible]	862.9	863.0	863.0	863.0	863.1	863.1
863.2	863.2	863.2	863.[illegible]	863.3	863.[illegible]	863.4	863.4	863.4	863.5
863.5	863.5	863.6	863.6	863.6	863.6	863.7	863.7	863.7	863.7
863.8	863.8	863.8	863.[illegible]	863.[illegible]	863.9	863.[illegible]	863.[illegible]	863.[illegible]	864.0
864.0	864.0	864.0	864.0	864.1	864.1	864.1	864.2	864.[illegible]	864.3
864.4	864.5	864.5	864.[illegible]	864.7	864.7	864.8	864.8	864.[illegible]	865.0
865.0	865.1	865.1	865.[illegible]	865.2	865.[illegible]	865.2	865.2	865.3	865.3
865.3	865.3	865.3	865.3	865.4	865.4	865.4	865.4	865.4	865.4
865.4	865.4	865.4	865.4	865.4	865.5	865.6	865.[illegible]	866.0	866.1
866.2	866.1	866.[illegible]	[illegible]	866.[illegible]	865.7	865.5	865.6	865.[illegible]	865.5
865.5	865.4	865.4	865.4	865.4	865.4	865.[illegible]	865.4	865.4	865.3
865.3	865.[illegible]	865.3	865.[illegible]	[illegible]	865.3	865.[illegible]	865.3	865.2	865.2
865.1	865.1	865.[illegible]	865.[illegible]	[illegible]	864.9	864.[illegible]	864.[illegible]	864.8	864.[illegible]
864.[illegible]	864.7	864.7	864.[illegible]	864.6	864.[illegible]	864.[illegible]	864.[illegible]	864.[illegible]	864.[illegible]
864.5	864.[illegible]	864.[illegible]	864.[illegible]	864.4	864.4	864.3	864.3	864.[illegible]	864.[illegible]
864.3	864.3	864.2	864.[illegible]	864.[illegible]	864.[illegible]	864.[illegible]	864.2	864.2	864.1
864.1	864.1	864.1	864.1	864.2	864.1	864.1	864.[illegible]	864.0	864.[illegible]
864.0	864.0	864.[illegible]	864.0	864.[illegible]	864.[illegible]	864.[illegible]	864.0	864.[illegible]	864.0
863.9	863.9	863.[illegible]	863.[illegible]	863.9	863.[illegible]	863.9	863.[illegible]	863.[illegible]	863.9
863.[illegible]	863.[illegible]	863.[illegible]	[illegible]	863.[illegible]	863.[illegible]	863.[illegible]	863.[illegible]	863.[illegible]	863.[illegible]

MAX OUTFLOW IS [illegible]. AT TIME 15.[illegible] HRS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	[illegible].	[illegible].	[illegible].	344.	1031[illegible].
CMS	119.	[illegible].	10.	10.	[illegible].
INCHES		[illegible]	27.97	[illegible]	28.00
MM		[illegible]	71[illegible]	711.25	711.25
AC-FT		[illegible].	71[illegible].	711.	711.
THOUS CU M		[illegible].	[illegible].	[illegible].	876.

STATION 10[illegible], PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	11.	11.	11.	11.	11.
11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	11.	11.	11.	11.	11.	11.	12.	12.	13.

13.	13.	14.	14.	15.	15.	16.	17.	18.	20.
22.	27.	[illegible]	38.	43.	48.	53.	59.	66.	75.
84.	93.	101.	110.	120.	120.	139.	149.	158.	167.
176.	186.	196.	206.	219.	235.	251.	265.	279.	292.
305.	316.	326.	337.	351.	371.	407.	652.	984.	1345.
1653.	1691.	1576.	1398.	1252.	1129.	1013.	913.	845.	792.
746.	707.	674.	647.	625.	604.	584.	562.	540.	521.
503.	468.	475.	465.	456.	442.	441.	478.	409.	401.
399.	377.	363.	349.	336.	323.	310.	298.	286.	275.
264.	254.	244.	234.	225.	216.	209.	204.	200.	195.
192.	186.	182.	178.	174.	170.	166.	162.	159.	155.
152.	148.	145.	142.	139.	136.	133.	130.	128.	125.
122.	120.	118.	115.	113.	111.	109.	107.	105.	104.
102.	101.	99.	97.	96.	95.	[illegible]	92.	90.	89.
88.	87.	85.	84.	83.	82.	81.	80.	79.	78.
76.	75.	73.	71.	70.	68.	66.	65.	63.	61.

STORAGE

289.	299.	289.	289.	289.	289.	289.	289.	289.	288.
288.	288.	288.	288.	288.	288.	288.	268.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	[illegible]	288.	288.	288.	268.	[illegible]	288.	288.	288.
288.	288.	289.	288.	288.	288.	288.	288.	289.	283.
288.	289.	289.	289.	295.	289.	283.	289.	289.	289.
289.	289.	289.	289.	[illegible]	[illegible]	[illegible]	289.	290.	290.
290.	290.	290.	290.	290.	291.	291.	292.	292.	293.
[illegible]	[illegible]	295.	296.	296.	297.	[illegible]	299.	299.	330.
301.	302.	302.	303.	304.	305.	[illegible]	306.	307.	308.
308.	309.	310.	311.	311.	312.	313.	314.	315.	315.
316.	317.	318.	318.	319.	320.	321.	322.	322.	323.
324.	325.	325.	326.	327.	328.	329.	329.	330.	331.
332.	333.	333.	334.	335.	336.	336.	337.	338.	339.
340.	340.	341.	342.	343.	344.	345.	347.	349.	351.
353.	355.	358.	360.	362.	365.	367.	369.	371.	374.
376.	379.	381.	383.	386.	[illegible]	[illegible]	392.	394.	397.
399.	401.	403.	406.	408.	411.	413.	415.	417.	419.
421.	422.	424.	425.	427.	430.	435.	444.	454.	462.
466.	467.	465.	463.	460.	457.	454.	452.	450.	448.
447.	448.	445.	444.	443.	442.	442.	441.	440.	440.
439.	439.	438.	436.	436.	438.	437.	437.	436.	435.
433.	431.	429.	427.	425.	423.	421.	420.	418.	416.
415.	413.	412.	410.	409.	408.	407.	405.	404.	403.
402.	401.	400.	399.	398.	397.	396.	396.	395.	394.
393.	391.	392.	391.	390.	389.	389.	388.	388.	387.
386.	386.	385.	385.	384.	384.	383.	383.	382.	382.
381.	381.	380.	380.	380.	379.	379.	378.	378.	378.
377.	377.	377.	376.	376.	376.	376.	375.	375.	375.
374.	374.	373.	373.	373.	372.	372.	371.	371.	370.

STAGE

[illegible]	[illegible]	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
[illegible]	[illegible]	861.6	861.6	861.6	861.6	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	[illegible]	861.6	861.6	861.6	861.6	861.6	861.6	861.6	861.6
861.6	861.9	861.6	861.6	861.6	861.6	861.7	861.7	861.7	861.7
861.7	861.7	861.8	861.9	861.8	861.8	861.8	861.9	861.9	861.9
[illegible]	861.9	[illegible]	862.0	862.0	862.0	862.0	862.1	862.1	862.1

862.1	862.1	862.2	862.2	862.2	862.2	862.2	862.3	862.3	862.3
862.3	862.3	862.4	862.4	862.4	862.4	862.4	862.4	862.5	862.5
862.5	862.5	862.5	862.6	862.6	862.6	862.6	862.6	862.7	862.7
862.7	862.7	862.7	862.8	862.8	862.8	862.8	862.8	862.9	862.9
862.9	862.9	862.9	862.9	863.0	863.0	863.0	863.1	863.1	863.2
863.2	863.3	863.3	863.4	863.4	863.5	863.5	863.6	863.6	863.7
863.7	863.8	863.8	863.9	863.9	864.0	864.0	864.1	864.1	864.2
864.2	864.3	864.3	864.4	864.4	864.5	864.5	864.6	864.6	864.6
864.7	864.7	864.7	864.8	864.8	864.9	865.0	865.2	865.3	865.5
865.6	865.6	865.6	865.6	865.5	865.4	865.4	865.3	865.3	865.2
865.2	865.2	865.2	865.1	865.1	865.1	865.1	865.1	865.1	865.1
865.1	865.0	865.0	865.0	865.0	865.0	865.0	865.0	865.0	865.0
864.9	864.9	864.9	864.8	864.8	864.7	864.7	864.7	864.6	864.6
864.6	864.5	864.5	864.5	864.4	864.4	864.4	864.4	864.3	864.3
864.3	864.3	864.3	864.2	864.2	864.2	864.2	864.2	864.1	864.1
864.1	864.1	864.1	864.1	864.0	864.0	864.0	864.0	864.0	864.0
864.0	863.9	863.9	863.9	863.9	863.9	863.9	863.9	863.9	863.9
863.8	863.8	863.8	863.8	863.8	863.8	863.8	863.8	863.8	863.8
863.8	863.8	863.7	863.7	863.7	863.7	863.7	863.7	863.7	863.7
863.7	863.7	863.7	863.7	863.7	863.6	863.6	863.6	863.6	863.6

PEAK OUTFLOW IS 1691. AT TIME 16.00 HOURS

	MEAN	MAX 6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1691.	1[illegible]	160.	154.	46234.
CMS	48.	54.	5.	4.	1309.
INCHES		9.94	12.52	12.[illegible]	1.55
MM		252.44	317.97	318.7[illegible]	318.76
AC-FT		252.	315.	315.	315.
THOUS CU M		311.	392.	393.	393.

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SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	10990	.48	1	4144.	2422.
		1.23)		(117.17)(	68.59)(
ROUTED TO	10990	.48	1	4034.	1691.
		1.23)		(114.24)(	47.89)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	861.60	860.00	865.00
STORAGE	249.	236.	436.
OUTFLOW	10.	84	411.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	866.17	1.19	499.	4034.	5.25	15.92	0.00
.50	865.60	.60	467.	1691.	2.58	16.00	0.00

PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 10990
ROUTE HYDROGRAPH TO 10990
END OF NETWORK

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
 LAST MODIFICATION   28 FEB 79
**********

RUN  DATE= 80/12/18.
     TIME= 14.03.42.
```

DAM SAFETY INSPECTION - MISSOURI
GUTHRIE LAKE DAM (MO.19[illegible]-00)
PERCENT PMF

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	ITRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 7 LRTIO= 1

RTIOS=	.30	.32	.33	.35	.37	.38	.40

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT RUNOFF PARAMETERS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10990	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISAME	LOCAL
1	2	.48	0.00	.48	1.00	0.000	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	26.00	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-99.00	0.00	0.00

CURVE NO = 494.00 WETNESS = -1.00 EFFECT CN = 99.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .23

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
```
```

SUM 32.24 31.49 .78 118996.
(819.31 800.31 19.81 3284.84)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH GUTHRIE LAKE

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10990	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.30	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-862.	-1

STAGE	860.00	860.50	861.00	861.50	862.00	862.50	863.20	863.60	863.90	864.40
	864.70	865.00	865.30	865.50	865.90	866.20	866.50	866.80	867.10	867.40
FLOW	0.00	.60	2.00	10.40	19.50	31.70	50.90	91.00	111.00	211.00
	311.00	411.00	890.00	1334.00	2403.00	4089.00	5512.00	7865.00	8759.00	10572.00
SURFACE AREA=	0.	11.	30.	42.	50.	74.	141.			
CAPACITY=	0.	42.	236.	336.	436.	744.	1882.			
ELEVATION=	838.	850.	860.	861.	865.	870.	880.			

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
860.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
865.0	0.0	0.0	0.

PEAK OUTFLOW IS 377. AT TIME 16.42 HOURS

PEAK OUTFLOW IS 459. AT TIME 16.33 HOURS

PEAK OUTFLOW IS 586. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 661. AT TIME 16.17 HOURS

PEAK OUTFLOW IS 789. AT TIME 16.17 HOURS

PEAK OUTFLOW IS 868. AT TIME 16.17 HOURS

PEAK OUTFLOW IS 985. AT TIME 16.08 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .32	RATIO 2 .32	RATIO 3 .32	RATIO 4 .35	RATIO 5 .37	RATIO 6 .38	RATIO 7 .40
HYDROGRAPH AT	1099.	.48	1	1453.	1550.	1599.	1695.	1792.	1841.	1938.
	(	1.23)	(	41.15)(	43.90)(	45.27)(	48.01)(	50.75)(	52.13)(	54.87)(
ROUTED TO	1099	.48	1	377.	455.	506.	671.	765.	845.	985.
	(	1.23)	(	10.68)(	12.88)(	14.33)(	19.00)(	21.67)(	23.92)(	27.88)(

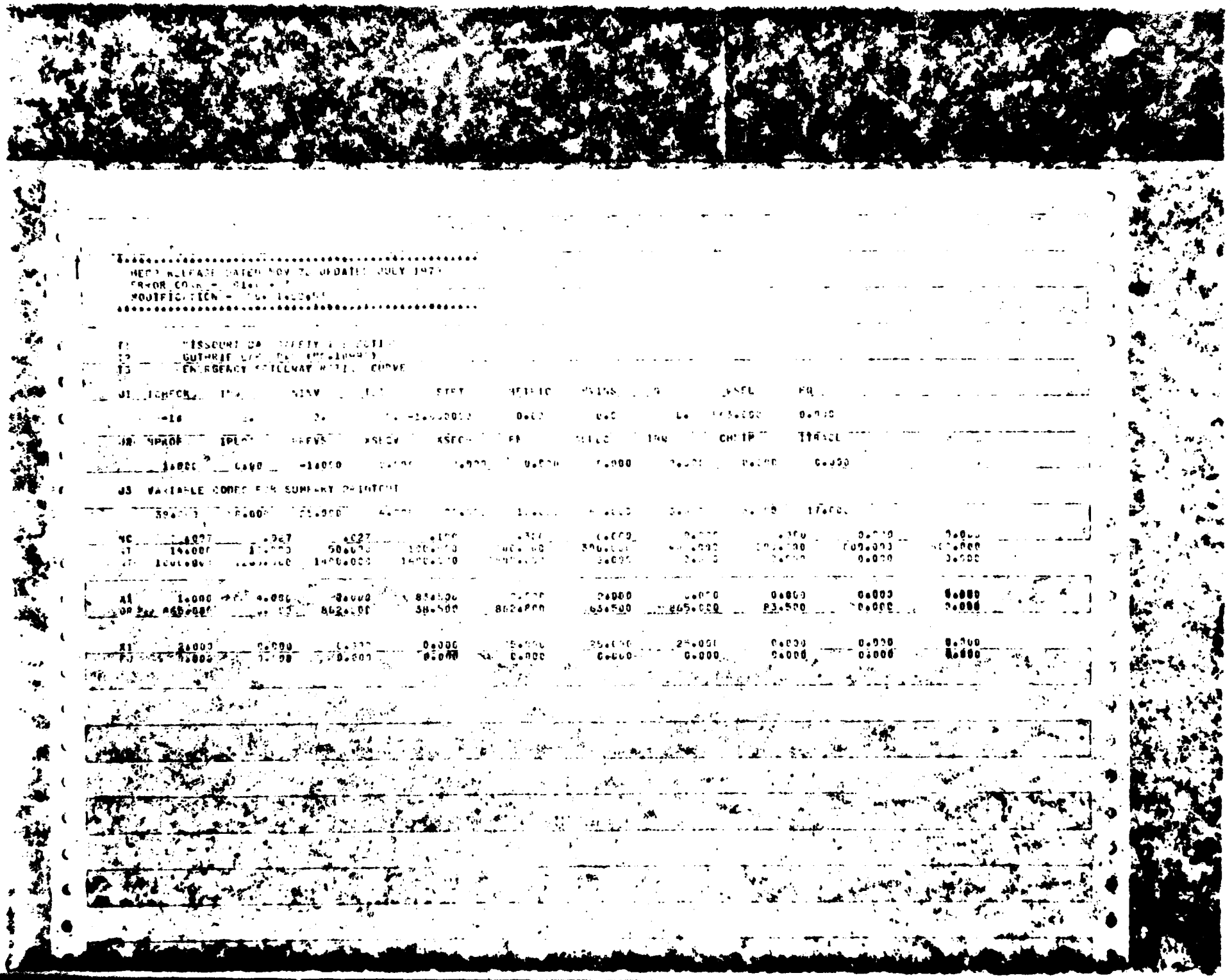
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	861.00	[illegible]	865.00
STORAGE	267.	236.	436.
OUTFLOW	10.	0.	411.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	864.90	0.00	431.	377.	0.00	16.42	0.00
.32	865.03	.03	438.	455.	.58	16.33	0.00
.33	865.07	.07	440.	526.	.83	16.25	0.00
.35	865.15	.15	444.	661.	1.17	16.17	0.00
.37	865.25	.25	448.	765.	1.50	16.17	0.00
.3	865.27	.27	450.	845.	1.58	16.17	0.00
.40	865.34	.34	454.	985.	1.75	16.08	0.00

HEC-2 INPUT AND SUMMARY TABLE



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HEC2 RELEASE DATED NOV 76 UPDATED JULY 1977
ERROR CORR - [illegible]
MODIFICATION - [illegible]
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

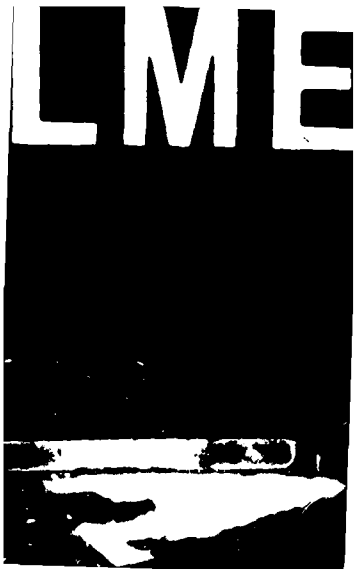
EMERGENCY SPILLWAY PATH

SUMMARY PRINTOUT

	SECNO	DEPTH	AREA	TOPWID	VCH	[illegible]	Q	[illegible]	10*KS	XLNCH
*	1.000	.16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.00
*	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.00
*	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.00	[illegible]	[illegible]	27.00
*	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	117.19	27.00
*	1.000	[illegible]	54.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.00
*	1.000	[illegible]	[illegible]	[illegible]	5.05	[illegible]	[illegible]	[illegible]	106.69	27.00
*	1.000	1.71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	102.21	27.00
*	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.00
*	1.000	2.17	[illegible]	[illegible]	.82	.72	[illegible]	[illegible]	97.39	27.00
*	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1000.00	[illegible]	[illegible]	27.00
*	1.000	2.51	153.94	83.50	7.30	.94	1200.00	866.36	90.17	27.00
*	1.000	[illegible]	176.71	83.50	[illegible]	1.04	1400.00	[illegible]	97.50	27.00
*	1.000	[illegible]	[illegible]	[illegible]	[illegible]	1.14	1600.00	[illegible]	[illegible]	27.00
*	1.000	3.19	202.25	83.50	8.90	1.23	1800.00	867.[illegible]	[illegible]	27.00
	2.000	[illegible]	[illegible]	33.90	1.01	[illegible]	[illegible]	[illegible]	17.27	27.00
	2.000	.73	25.50	49.51	1.96	.36	[illegible]	865.[illegible]	26.77	27.00
	2.000	1.03	39.79	52.15	2.59	.13	100.00	[illegible]	[illegible]	27.00
	2.000	1.43	62.98	63.09	3.18	.16	200.00	[illegible]	33.43	27.00
	2.000	1.73	87.50	71.18	3.59	[illegible]	300.00	[illegible]	34.53	27.00
	2.000	1.98	101.41	77.00	3.94	.24	400.00	[illegible]	36.09	27.00
	2.000	2.19	112.52	83.24	4.22	.28	500.00	865.27	36.78	27.00
	2.000	2.51	133.47	83.50	[illegible]	.31	600.00	865.[illegible]	[illegible]	27.00
	2.000	2.58	159.03	83.50	5.03	.39	800.00	865.87	36.[illegible]	27.00
	2.000	2.99	180.73	83.50	5.53	.49	1000.00	866.21	37.05	27.00
	2.000	3.10	200.70	83.50	[illegible]	.56	1200.00	[illegible]	37.91	27.00
	2.000	3.41	220.72	83.50	6.34	.62	1400.00	866.84	37.86	27.00
	2.000	3.63	238.83	83.50	6.70	.70	1600.00	867.15	39.27	27.00
	2.000	3.85	[illegible]	83.50	7.03	.77	1800.00	867.41	38.65	27.00

SUMMARY OF ERRORS

CAUTION SECNO= 1.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1.000 PROFILE= 4 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1.000 PROFILE= 5 CRITICAL DEPTH ASSUMED


LME